Automotive Service Digest

Our 46th year

October, 1958

Taking "power prints" on petroleum products.

2 reasons why engines get more power protection from Perfect Circle

1. PERFECT CIRCLE 2-in-1 CHROME SETS

solve problem of excessive oil consumption past pistons!

2-in-1 Chrome sets provide the finest piston rings obtainable! Top rings and oil rings are plated with thick, solid chrome. Entire area of ring travel gets complete wear protection, *more than doubling* life of cylinders, rings, pistons. No tedious break-in is necessary, rings are pre-seated at factory.

INSURE CUSTOMER SATISFACTION—install 2-in-1 Chrome sets for thousands of extra miles of power protection and positive oil control!

2. PERFECT CIRCLE VALVE SEALS

solve problem of excessive oil consumption past valves!

New rings and restored valve efficiency produce higher compression pressures... and higher deceleration vacuum. Increased vacuum sucks oil through loose or worn valve guides. Stop this oil loss with *new* Perfect Circle Valve Seals!

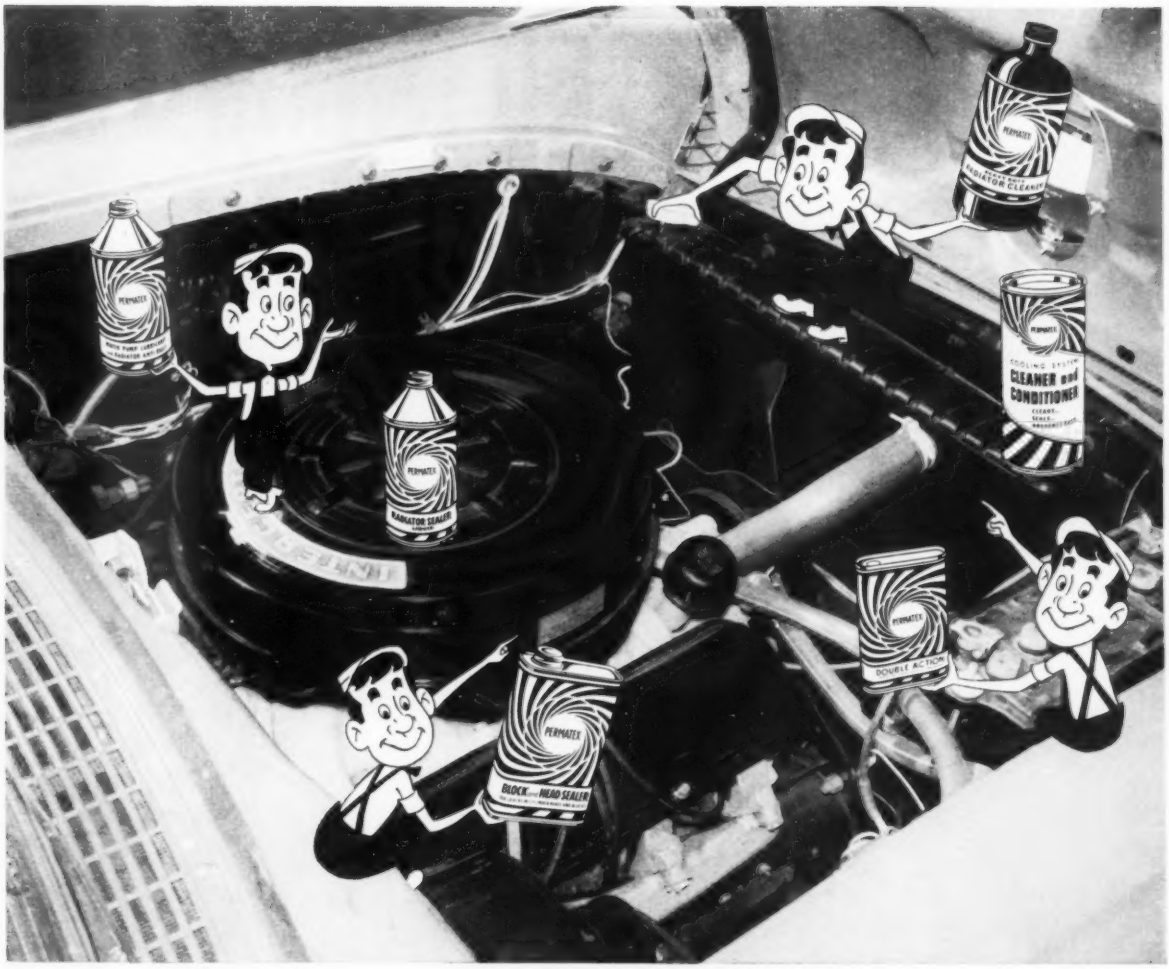
INSURE CUSTOMER SATISFACTION—Install Perfect Circle Valve Seals on all re-ring jobs and all overhauls.

PERFECT CIRCLE

PISTON RINGS AND POWER SERVICE PRODUCTS

Hagerstown, Indiana

Don Mills, Ontario, Canada



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Send for your copy of the Permatex Catalog . . . which tells you how and where to use every member of this famous automotive chemical family. Ask your jobber or write us.

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No. 561

Automotive Service Digest

October 1958

Cover

This mechanical treadmill is used for indoor road tests of gasoline and oil products under controlled conditions. Car can be "driven" up to 120 m.p.h., yet stand still on Pure Oil Company's new chassis dynamometer at its Research Center, Crystal Lake, Ill.

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For November

● We've heard it said that the fellow who keeps his lips sealed keeps out of trouble. By the same token, keeping the engine and chassis parts tightly sealed keeps cars out of trouble. We bring you the latest know-how on this with pictures that "tell all" eloquently—if soundlessly.

SYMBOLIZES A.S.D. "TECH KNOW-HOW" FEATURE ARTICLES

LEARN MORE EARN MORE A S D SERVICE EDUCATION

SYMBOLIZES A.S.D. "BUSINESS KNOW-HOW" ARTICLES

Instrument corner

Conducted by The Instrument Man in the interests of simpler, faster, more satisfactory—and more profitable—service operations.

• HAVING JUST COMPLETED filling out an order for a new customer, the Instrument Man took a few moments to pass along some helpful and valuable "pointers" (he'd previously instructed the shop operator thoroughly in how to use the instruments):

"Bill, there are some things you must always keep in mind when tuning or trouble shooting on the power plant. Keeping today's high compression engines in top running condition requires expert knowledge of testing procedures and understanding of the ignition, fuel, starting, and electrical systems and the battery. I think you have had enough experience in working with these systems, to know what to do. Testing is the only way that troubles can be recognized and located in most cases. When the cause of trouble is known, correcting it is generally relatively simple.

When you are handling hard starting complaints, check these electrical items—the battery gravity should be at least 1.250 or more, and when you check it, be sure to make the temperature allowance of 4 "points" of gravity for each 10° of difference from the base temperature of 80°F., adding for temperatures above 80° and subtracting for those below 80°. To remember whether to add or subtract, you know that the electrolyte gets denser when cold, so you have to subtract accordingly to compensate for a higher gravity reading due to temperature alone.

Battery cables should be clean and tight. Check both the insulated or "hot" side and the grounded side of the battery circuit for excessive voltage drop. Check the starting motor connections, motor brushes, and commutator condition. If cranking motor condition is suspected, check the current draw while turning the engine over—it should not exceed 175 to 200 amperes with a hot engine.

Check the spark plugs for gap size, electrode condition and heat range. If the plugs look like they are in condition to justify further use, the center electrode should be filed flat and square and the gap reset. Check the distributor for correct cam angle or dwell, for ignition timing, cracked cap or rotor, worn distributor shaft bushings, and contact point condition.

Examine ignition cables for conditions that may lead to electrical leakage and cross-firing. Check for high resistance due to looseness or corrosion in the coil or distributor cap towers. Make sure that all ignition circuit connections are tight.

Check carburetor idle adjustment, accelerating pump, action of the automatic choke, and free action of the heat riser valve.

An important test you can make now is fuel pump pressure and delivery. Pump pressure should be from 4 lb. to 7 lb. or even higher on some of the late models, and the delivery, at least 1 pint in 30 seconds.

Above all, keep in mind that the right way to find the causes of trouble when the engine isn't running right, is **Test, Don't Guess!"**

WHY INSTRUMENT CORNER?

Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

It Pays to Listen

The Instrument Man stopped to call on a shop where he had never been very courteously received, or been able to sell any equipment. This time when the shop operator told him, "I'm getting along fine without any of your high priced gadgets. I've been in this business for fifteen years and I ought to know how to fix cars by this time," he answered: "You sure *ought* to know how to fix 'em—it's too darned bad you don't. What a pity you haven't sense enough to know that instruments are an investment that will make money for you, not an expense! I sure won't bother you any more, but one of these days you are going to need me pretty bad. When you do, if I'm not too busy I *may* come around to see you." With that, the Instrument Man walked out, got in his car and drove off to make his next call. He figured that talking rough to the guy might wake him up, and he knew from dealing with others of the same type that more than half of them would call for help in the next couple of months . . . those that didn't were not good sales prospects anyway.

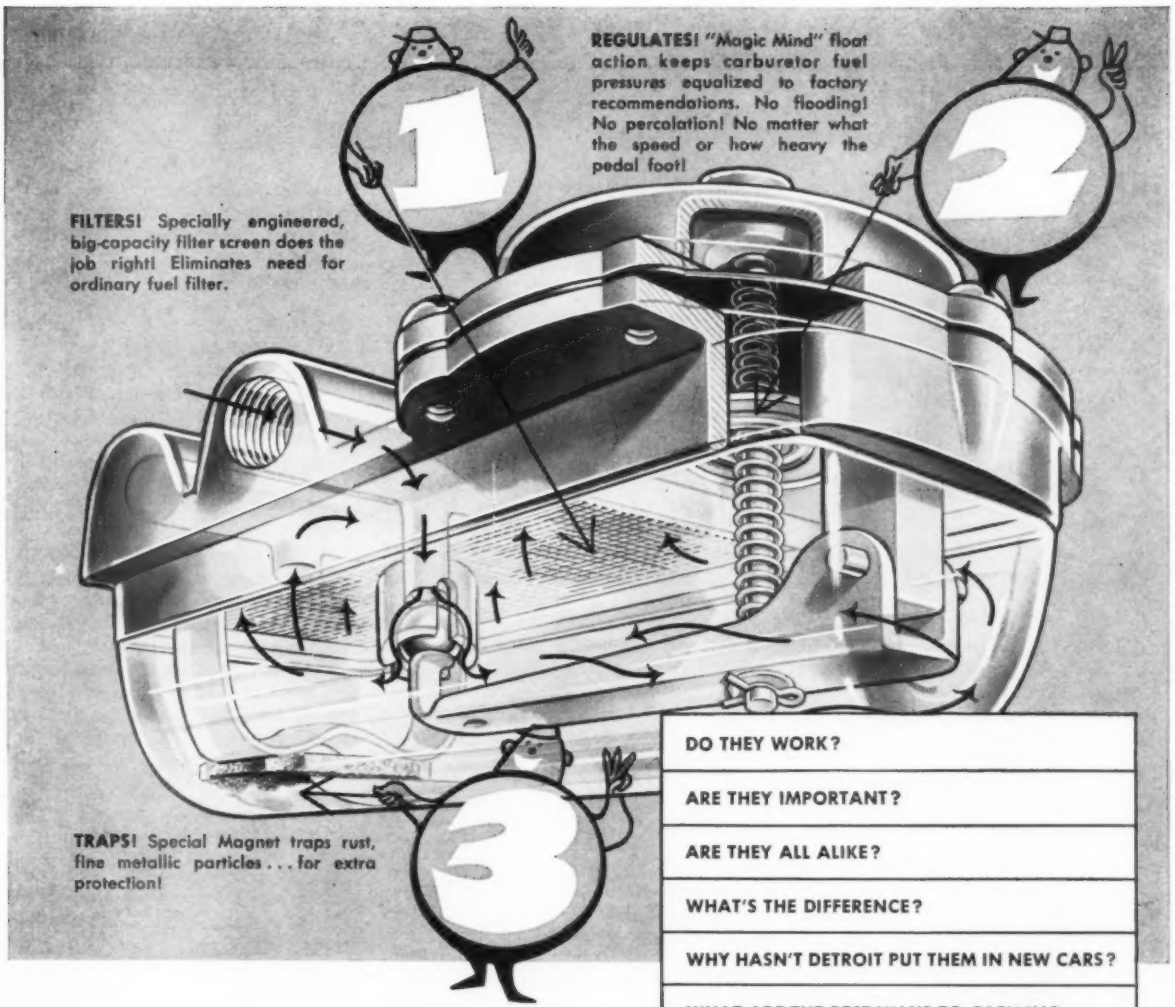
Sure enough, about six weeks later, a call came into the office from this prospect, asking the I.M. to stop in as soon as he could conveniently. So that afternoon, he stopped in, and found the shop man looking baffled. "Maybe you can help me out, Jim," the operator began apologetically.

Then he went on to explain that a '54 Chevrolet had been brought in two weeks ago with the complaint that it was hard to start, particularly when hot. The owner could usually get it going, but only with difficulty. Pumping the accelerator, holding the throttle open, or leaving it in idle position seemed to make no difference.

Two men in the shop had worked on the car intermittently, trying to overcome the difficulty without success. The carburetor was rebuilt, a new fuel pump was put on, and a different set of spark plugs was installed. A pressure regulator was put in the fuel line, the starting motor was rebuilt and the starter solenoid and switch were replaced. A new battery was also installed. All this failed to help; and the customer was getting pretty mad.

On a previous visit, the Instrument Man had noticed a voltmeter over in

(Continued on page 76)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FILTERS! Specially engineered, big-capacity filter screen does the job right! Eliminates need for ordinary fuel filter.
TRAPS! Special Magnet traps rust, fine metallic particles . . . for extra protection!
1
2
3
DO THEY WORK?
ARE THEY IMPORTANT?
ARE THEY ALL ALIKE?
WHAT'S THE DIFFERENCE?
WHY HASN'T DETROIT PUT THEM IN NEW CARS?
WHAT ARE THE BEST WAYS TO CASH IN?

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BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

New exterior paints are showing up on most all the 1959 cars. Acrylic lacquer and metallic super enamels seem to be getting the most play. Both these paints have passed rugged field testing which proved them capable of holding their initial luster much longer than standard automotive paints.

* * *

Care should be taken when recommending sealing and polishing treatments for these specially painted surfaces. Acrylics, for example, should not be treated with sealers nor waxed for about sixty days. After this time, the paint should be "cured" enough for polishing. Curing, as applied to acrylic paint, usually means that it takes a considerable length of time for the volatile solvents to leave the paint film.

* * *

Super enamels may be waxed immediately, in some instances. Paint and wax companies are getting together literature explaining uses and abuses of new-type automotive finishes.

* * *

Aluminum engines haven't appeared in production cars this year—as some unimpeachable sources predicted—but they are definitely in the very near future. New alloys of aluminum show great promise of delivering wear and scuff-proof surfaces so necessary in engine blocks. Once research is successful in developing satisfactory materials, it won't take long for design engineers to work them into the engine compartments.

* * *

Dry-type air filter elements are reportedly not being maintained in adequate inventory in many places. Several authentic surveys indicate these elements aren't being pushed as replacement items. Common practice is to remove the old element, tap it a couple of times, and then re-install it. Even when the element is obviously ragged and torn, the service repairman seldom has a new one on hand to sell. It may be wise to stock up on a few of these paper parts and advertise their availability. This could increase traffic and lead to more and bigger sales.

* * *

Legislation is being shaped—on both the state and national levels—to set standards for dual-headlamp adjustment. Some states do have official standards which dictate the lawful adjustment of single headlamp units, but the "four eyes" are causing considerable conversation when it comes to adjustment. On one hand, there are those that say the manufacturers should set their own adjustment specs. Others feel that the states should get into the act and set their adjustment limits. If you are adjusting headlamps according to the instructions on the adjusting tool, you're probably O.K. If your state has laws covering adjustment specs, by all means find out what the law requires. You could be liable if you are violating the law—consciously or not.

* * *

Front Wheel bearing specifications have changed for 1958 Buicks, Cadillacs, Chevrolets, and Pontiacs. In some instances, this is the first time since 1941 that these part numbers have been changed. The following numbers are now in effect:

Buick (all models)
Inner: 909065 Outer: 909066
Cadillac (60, 62, 70)
Inner: 909073 Outer: 909066
Cadillac (75, Brougham, 86)
Inner: 909025 Outer: 909072
Chevrolet (6 cyl.)
Inner: 909067 Outer: 909070
Chevrolet (8 cyl. & Corvette)
Inner: 909067 Outer: 909070
Pontiac (all)
Inner: 909067 Outer: 909070

Watch these numbers when replacing front wheel bearings on the involved automobiles. And be especially alert when adjusting these, or any other, wheel bearing. Much investigation is underfoot to come up with improved adjusting specs. General concensus seems to indicate a .001" end clearance is the best setting for either ball or tapered roller bearings.

* * *

Recent editorials in many newspapers are aimed at exciting a little interest in steering unsuspecting young men along the dirty fingernail route. "Skilled mechanics are a vanishing breed," states one such story. At this moment, there is one qualified mechanic for every 91 registered vehicles nationally. Just a short while ago this ratio was one ironbender for every 87 cars. Things are getting worse as far as the number of working mechanics is concerned. This is hard for the public to understand. They seem to picture a mechanic as ex-king Farouk in coveralls — independent, unreliable, and rolling in dough. Maybe someone should start waving the banner of cost of hand tools (can't remove some spark plugs without a special tool), some debatable flat-rates, and the constant year-by-year training necessary for even the most experienced mechanic. These are some of the real reasons why the scarcity of mechanics. In other words, it's not a deep sociological problem; it's money! When mechanics get paid in direct proportion to the value of the service they perform, there'll be plenty of eager applicants. Why, if the price were right, some men would even be willing to spend a night in a haunted house with a glamorous movie star.

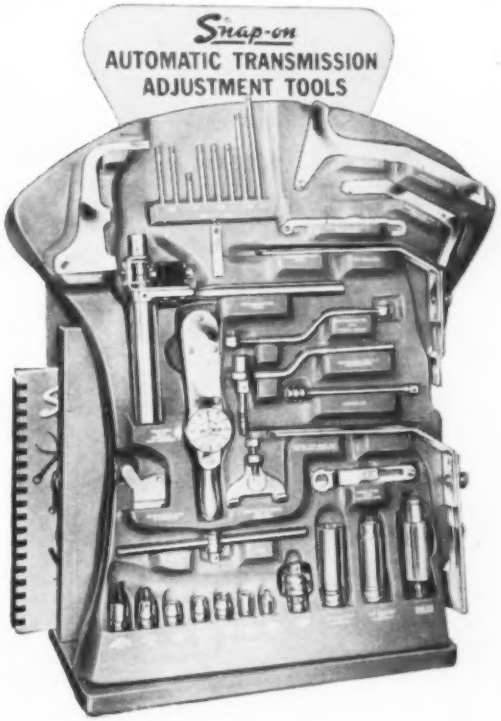
NO MYSTERY — JUST BIG RETURNS —

with these Snap-on® Automatic Transmission Tools

It's so easy, any mechanic can handle automatic transmission adjustments with these *Snap-on* sets. The tools make this work as simple as a brake adjustment job.

And the returns are big! All over the country, sets like these have paid for themselves in short order. You can adjust practically any automatic transmission; many jobs take only a half hour or less. And a properly adjusted automatic transmission means big savings and greater satisfaction for the car or truck owner.

These valuable income boosters can be yours on easy payments. Ask your *Snap-on* man for full details or write us.



Automatic Transmission Tool Set 2035-AT-S

This set handles band and linkage adjustments on Hydramatic, Dynaflow, Powerglide, Fordomatic, Mercomatic, Flightomatic, Powerflite, and Turbodrive transmissions. It's quick and profitable because an estimated 70-75 percent of all adjustments can be done externally, without removing transmission. Photographs and easy-to-understand instructions in *Snap-on* instruction book make the job extra simple.

AUTOMATIC TRANSMISSION SET AND OIL PRESSURE SET COMBINATION
Available on convenient credit terms.

Oil Pressure Gauge Set AT-67-MB

This set checks pressure of oil at critical points within transmission . . . reveals inside troubles which can't be corrected by band and linkage adjustments . . . eliminates needless work. Also, these gauges are necessary for setting linkage on certain transmissions. Small gauge is calibrated to allow low-pressure throttle and governor tests recommended on many 1957-1958 cars.

On transmission overhaul, gauges localize trouble area; spot oil leaks, pressure leaks, faulty servo pistons, clogged screens. Use on Dynaflow, Flightomatic, Fordomatic, Hydramatic, Mercomatic, Powerflite, Powerglide, Studebaker, Turbodrive and Ultramatic transmissions.

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The engine laboratory area, heart of Champion's new center, has the most modern spark plug test facilities ever built. Able to handle the largest automotive gasoline engines made, these units even have hi-fi equipment for safely monitoring the sounds of an accelerating or wide-open engine from behind bulletproof-glass windows. Here Champion tests newly developed engines to determine the exact spark plug needed for peak performance. When necessary, Champion designs a new plug specifically for an engine.

Champions are engineered for every car made by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard, and every major foreign maker

CHAMPION SPARK PLUG

even better performance...

Research and Engineering Center for spark plugs!

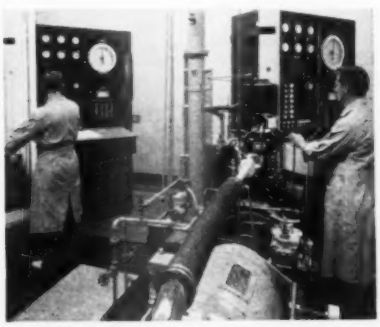
Champion-sparked performance has long been the world's finest—and racing records prove it! Now Champion's constant efforts to make that performance even better will have the benefit of the world's finest facilities for spark plug development

This month marks the official opening of the world's largest and most modern facilities for spark plug development—the new Champion Research and Engineering Center.

What do these new facilities mean to you and your customers? They mean that Champion Spark Plugs will keep on delivering the finest possible performance in the future, just as they do today.

These new facilities are the finest in existence for the development of spark plugs. And Champion has the men who can get the most from them—the *spark plug specialists* of the world's largest research and engineering organization devoted exclusively to spark plugs. Champion has the "know how" that produced, for example, the exclusive 5-rib Champion insulator that sharply cuts flashover shorting . . . the Powerfire electrode that delivers top performance longer in modern engines . . . and the projected core-nose plug-type that has been so successful in General Motors overhead-valve engines. And Champion produces the spark plugs that power the world's finest performance, as proved by racing records.

The unbeatable performance that Champions deliver *now*—plus the promise of *even better* performance to come—are two of the best reasons in the world for always recommending *Champion* Spark Plugs—for any make of car!



In one lab, specially designed test engines, precisely controlled and adjusted, are used to punish plugs with engine conditions far more severe than any found in actual use.

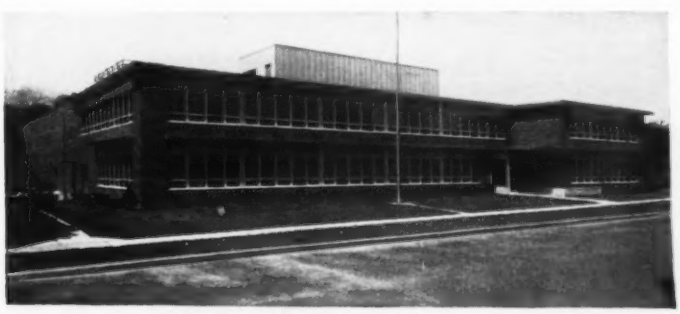
The electronics laboratory develops new instruments and methods for analyzing and checking problems of ignition and combustion as they affect spark plugs.

Racing proves *any make of car* does its best with Champions! Champions sparked 8 of the last 9 Indianapolis winners, 96% of all NASCAR stock-car victors during the last 5 years.

Dependable 5-rib

CHAMPION

SPARK PLUGS



Everything in this new center has the one purpose of giving you and your customers the best possible spark plug performance. Here research experts study basic problems such as temperature ranges, fouling, and preignition limits to develop materials, alloys and designs that will improve performance even more.

COMPANY • TOLEDO 1, OHIO

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Serve, Sell and Excel with NIEHOFF ignition parts and testing equipment

Start right out being an ignition expert with satisfied customers praising your service. Proper testing equipment and Niehoff ignition parts make a prospect of every car that turns into your place of business. Every sale a profit. Small invested capital brings big returns—lets you

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SELL ignition "know how". Niehoff makes it simple to select, install, satisfy. You become an expert. Cabinet stock system means no high inventory cost.

EXCEL—Quality so superior repeat business is automatic.

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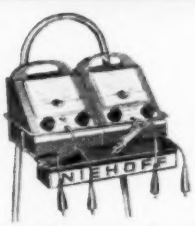

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Editor's page

No room for error

● STRAWS IN THE WIND portend 1959 as a great year for the automotive service business, dollar-wise and otherwise.

The 1959 American car models have made their debut and from all indications will be bought to an extent making good the manufacturers' boast of selling 5.2 million domestic new cars in 1959.

Automobile dealers have quite generally disposed of their stocks of '58 cars to buyers, swelling the list of people who own cars and who must have them serviced.

Expressways and toll roads are being completed in many sections of the country; others will be completed and ready for use in 1959. It all points to more cars than we ever have had. These cars, collectively, will roll up many more miles, a lot of them in less time . . . more miles per car, per year.

Nor must we forget the increasing influx of import cars, whose owners will drive our highways and streets and which may in time become a sizeable segment of motor vehicle registrations.

All of the foregoing assures a tremendous amount of service work in its many ramifications. Service, now more than ever, must run a course of accomplishment parallel to that of car design, engineering and production. In design conception and functional improvements, the new '59 models outshine their predecessors. It's the service shop's job to help customers get maximum efficiency performance as economically as possible.

Servicing the new cars is a big challenge. It calls for precise workmanship, the best and most suitable equipment along with a liberal sprinkling of able supervision and technical know-how. Here's one reason why:

Even with the steady climb to higher brake engine horsepower over the years, considerable power is lost between the engine and the rear wheels, where power gets in its final and useful effort for vehicle propulsion. For example, an engine for which the factory specs show 300 brake horsepower, may actually deliver 175 horsepower on a rear wheel horsepower dynamometer test. The "lost" 125 horsepower is the toll taken by various chassis units, by friction, exhaust, cooling, wind resistance, rolling resistance and so on.

To this must be added the gradual falling off in power due to normal parts wear, leakage and maladjustments. It points to the necessity for service to recapture as much of what might be called the "wasted" horsepower as possible. It points to the great need for skillful repairing, adjusting and tuning to coax more horsepower from the customer's car. It means doing service work right the first time, and every time—with no room for error.

Ben Ikert
EDITOR

Provide winterizing in a package

It's an axiom that you have to "tell to sell" . . . but equally important is to have the right product and knowledge of its benefits to the motorist. With the advent of winter—one of the seasons of top service sales potential—a smart shop prepares to help the customer help himself to full protection.

• CONDITIONS IMPOSED BY winter weather force the automotive powerplant, and other car components as well, to start and work under more severe loads. To insure reasonably satisfactory cold weather operation, the motorist must depend on the service shop for adequate preparation . . . and for sound advice as well.

Since anti-freeze protection is the primary need of all vehicles operating in the snow belt, there is a tendency for motorists to feel that the proper coolant mixture is all that's required for winter. Nothing is further from the truth, of course—for to avoid "bad weather" starting and operating problems, the battery, the generating, ignition, starting and exhaust systems, as well as the cooling system, should be put in top working condition. Further, and equally important, the steering and braking systems must function at their best.

MAKE IT EASY!

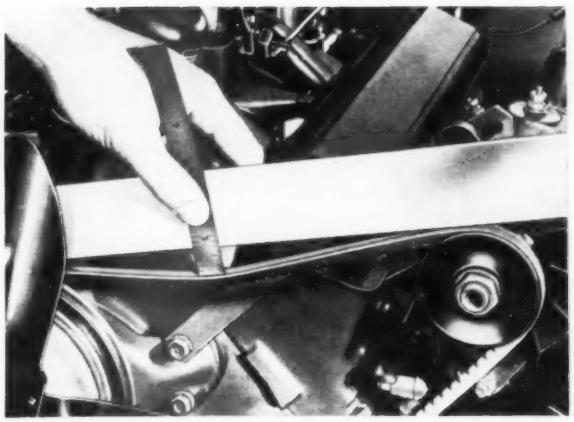
If the customer is to know how to go about the matter of protecting his car—and his pocketbook—properly, his service shop must give him all the needed information, and at the right time. There is bound to be a wide variation in both the needs—beyond simple addition of anti-freeze to the radiator—and the ability or willingness to invest in the work, among customers.

One excellent way to simplify the matter . . . and to win the customers' appreciation . . . is to offer a number of service "packages." These would differ in price and in the extent of servicing; and if properly presented would give the motorists a clear idea of what he might need, and what it would cost him.

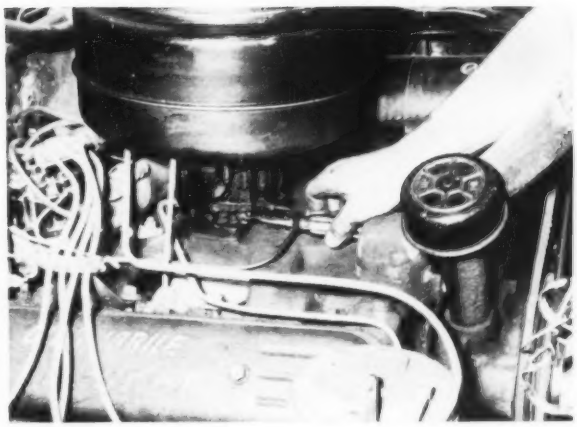
To illustrate, let's start with the maximum, the full list of the things that *should* be done to insure, as far as possible, that any car will perform at its top potential under adverse weather conditions. The necessary work is detailed quite fully in the "Checkpoints of Winterizing Service," shown on page 16.

Naturally, in some cases the owner will have had some of these jobs done recently, and so will not need the "full treatment." In other cases, for one reason or another, he may be satisfied to have some of the work done, and omit some precautionary service—in which

Before long, this will be a familiar scene in parts of the country where Winter's full fury is felt. Be sure your customers' cars are ready for the onslaught of temperature drop, and the rough going.



The pump-generator belt should be so adjusted that there is approximately $^3/_4$" deflection in the longest span between pulleys.



Adjusting the carburetor idling screws for cold weather engine performance should be done with engine at normal temperature.

case, of course, "he's the doctor." However, the service shop might very advantageously prepare, and announce, a number of packages, each incorporating a given number of the "checkpoints"; and each with its individual price.

Three logical packages might be: "Easy Start Winterizing"; "Powerplant Winterizing," and "Overall Winterizing." The first would include the work itemized under 1 through 5 in "Checkpoints" — servicing the cooling, generating and starting, lubricating, ignition and fuel systems. "Powerplant Winterizing," could cover the same points, plus the lighting, exhaust and brake systems, as detailed in points 6-8. "Overall," of course would describe the "full treatment," all 10 points.

By offering winterizing on the package plan, the shop gives the car owner a clear picture of what he might require and what it would cost him. It also enables him to plan on having all the necessary service work done at one time—to the advantage of all concerned, particularly during the late Fall rush.

DO THE JOB RIGHT

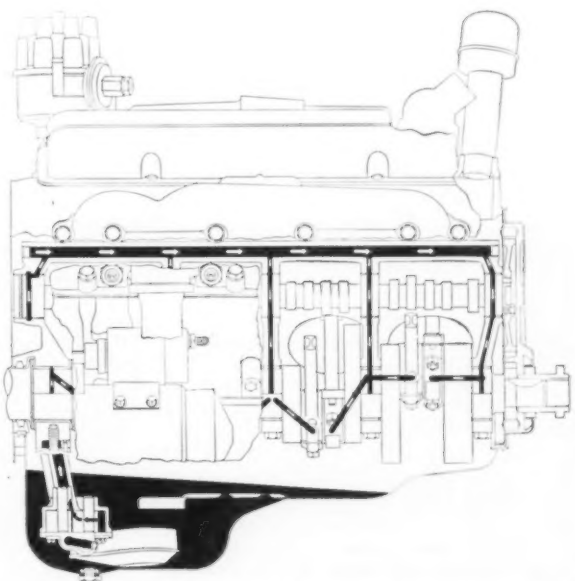
Before the annual winterizing season ends, every member of the service shop crew will undoubtedly be "sharp as a tack" in all the key inspection, adjustment and repair procedures. However, for best results all around, *start out* by reviewing the requirements of the work—a sure way of making more customers happy, getting more jobs done, and having the minimum in complaints and rework. Let's lead off our brief review of the highlights, here, by running over the cooling system itself.

The cooling system usually comes to mind first in a winterizing program, because of the realization that antifreeze is essential in areas where atmospheric temperatures fall below—and sometimes far below—the freezing point of water. So, the coolant (sounds odd since it's the coolant's job to keep the engine *warm* in winter) actually becomes a most important component of the cooling system side-by-side with the, strictly speaking, mechanical components—such as pump, radiator, thermostat and so on. As such, the coolant must be given every opportunity to function.

Seasonal rust-proofing and regular cleaning of the cooling system goes a long way towards eliminating clogging and ridding the system of an insulating layer of rust, grease and mineral scale. If regular cleaning has been neglected cleaners are necessary to restore adequate cooling. Approved chemical cleaners are available and should be used according to the maker's instructions.

In severe cases separate air-water flushing of the radiator, engine block and car heater may be necessary. Obviously, if the radiator tubes are badly plugged, ordinary cleaning has little or no effect. Such a radiator requires the services of a radiator shop for cleaning. To avoid subsequent radiator clogging the block must also be thoroughly cleaned otherwise the pump action will again carry foreign matter back into the radiator.

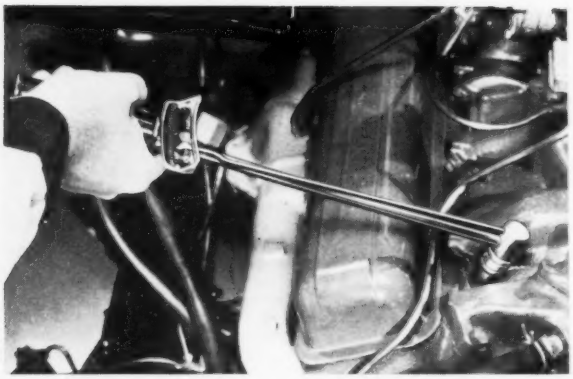
Pay particular attention to the head gasket, the old one may have been improperly fitted, causing leakage. If a new gasket is fitted, be sure it is designed for the engine in question; and install it according to the car maker's specifications. Also, use a torque wrench when replacing the head and follow the specified sequence in tightening. It's important on all engines and more so on engines of modern vintage.



The inter-relationship of the cooling and lubrication systems becomes an increasingly important factor in cold weather engine operation. Like the coolant, engine oil must be quickly warmed-up for proper circulation.

And, here's a point about steel embossed head gaskets

(Continued on following page)



Prevention of internal head gasket leakage is especially important in cold weather, because of the greater expansion in cold-standing engines. Torquing intake manifold capscrews and cylinder head bolts is good insurance for winterizing service.

Winterizing . . . CONTINUED

used in 6 and 8-cylinder engines. Tests made by one gasket manufacturer reveal that the steel embossed gasket apparently gives better results in sealing blocks and heads when the latter are ground on their mating surfaces to about 100-150 micro inches. The coating on these gaskets has a tendency to adhere to the head and block better if the finish is somewhat rougher, as obtained with a grind of 100-150 micro inches, it is stated.

To do a complete job of winterizing many shopmen pull all the head bolts and coat the threads with non-hardening gasket cement. Many head bolts extend into the water jacket.

Use of a 180 deg. thermostat in cold weather improves engine operation, reduces tendency towards crankcase sludging and corrosion of parts. The 180 deg. thermostat also provides better car heater performance. However, a 180-degree thermostat should not be used with low boiling point alcohol or methanol antifreeze.

Coolant leaks at the water pump may occur at the shaft seal, thrust washer seal or at the housing gasket. While the thrust seal is self-adjusting, it may wear in time and require replacement. Frequently, complete pump replacement is the answer.

It's well to bear in mind that water pump and fan belt drives carry more load in modern engines. Correct performance of the cooling system, and equally important, the electrical system, depend upon the physical condition of the belt, pulleys and belt tension adjustment.

With more hose used on modern cars, inspection and replacement is more important. Well-known to shopmen is the fact that hose may look O.K. on the outer surface, while the inside is deteriorated. A soft lower radiator hose may collapse at high engine speed due to water pump suction, and cause coolant flow restriction. To be on the safe side all questionable hose should be replaced with new. Before hose is installed the tube connections should be cleaned and a suitable non-hardening sealing compound applied to the tube ends.

Let's not forget the radiator pressure cap. If the rubber face of the valve is defective a new cap should be installed. This should be of the type and pressure rating as specified by the car manufacturer.

LAST, BUT FAR FROM LEAST

When the mechanical components of the cooling system have been serviced for cold weather operation there comes the final component to consider—in areas where freezing occurs, namely anti-freeze. It is agreed by authorities—the National Bureau of Standards, Society of Automotive Engineers, Ordnance Corps., U.S. Army, Automobile Association and practically all motor vehicle manufacturers—that *fresh* inhibited anti-freeze should be used in cooling systems for Winter operation.

This stand is taken because of the fact that rust inhibitors in any make of anti-freeze are weakened or wear-out with use. Authorities state that there is no

CHECKPOINTS OF WINTERIZING SERVICE

1. COOLING SYSTEM
   - Drain and flush radiator and block.
   - Check radiator pressure cap.
   - Check core for cold spots.
   - Check all gaskets and plugs for leakage.
   - Check fan belt condition and tension.
   - Check hoses and tighten clamps.
   - Correctly torque head and manifold bolts.
   - Check water pump.
   - Drain, clean, flush and fill with anti-freeze.
   - Check thermostat.
   - Make sure overflow pipe is not clogged.

2. GENERATING AND STARTING SYSTEM
   - Test battery (including voltage drop while starting motor is operating).
   - Charge battery if necessary; clean and tighten cables.
   - Check generator charging rate.
   - Check lock torque of starter motor.
   - Check solenoid switch.
   - Check commutator and brush wear.
   - Tighten all electrical connections.

3. LUBRICATING SYSTEM
   - Change engine oil.
   - Check filter, change if necessary.

4. IGNITION SYSTEM
   - Clean and gap spark plugs (replace if necessary).
   - Check breaker points, replace if necessary.
   - Check and adjust cam angle.
   - Check and adjust ignition timing.
   - Check both primary and secondary wiring.

5. FUEL SYSTEM
   - Adjust carburetor idle mixture.
   - Check fast idle and linkage.
   - Check heat riser valve.
   - Check automatic choke.
   - Clean fuel pump strainer.
   - Check fuel pump pressure and delivery rate.
   - Check air filter.

6. LIGHTING SYSTEM
   - Check operation of all lamps and turning signals, and replace any defective bulbs.
   - Check headlight aim, adjust if necessary.

7. EXHAUST SYSTEM
   - Inspect muffler, exhaust pipe and tail pipe.
   - Tighten manifold nuts.

8. BRAKE SYSTEM
   - Check fluid level in reservoir.
   - Check all lines for leaks.
   - Adjust brakes.
   - Tighten emergency cable.
   - If necessary, pull a wheel to examine lining, drum and cylinders.

9. STEERING SYSTEM
   - Check for play in king pins or ball joint suspension.
   - Check for play in steering linkage and gear box.

10. RUNNING AND SUSPENSION GEAR
    - Check shock absorber condition.
    - Check springs for sagging, broken leaves.
    - Check front end alignment.
    - Check wheel balance.
    - Check tires for wear, cuts and proper pressure.
    - Lubricate chassis.

easy, dependable way to ascertain the condition of the rust inhibitor in used anti-freeze.

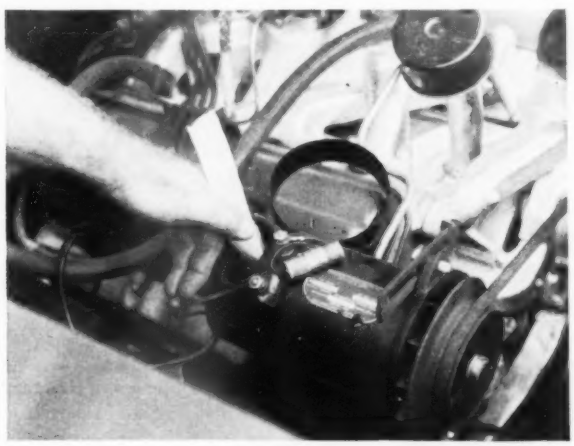
As to the depletion of corrosion inhibitors here is what the National Bureau of Standards says in a bulletin, "Automotive Anti-freeze":

"As coolant losses from evaporation are usually small in comparison with those that result from leakage or overflow, replacement may be made by adding an anti-freeze solution of strength equal to that originally prepared if no hydrometer is immediately available. The anti-freeze protection may be checked periodically by a suitable hydrometer, particularly after any addition of solution."

MANY FACTORS TO CONSIDER

There are many factors to be considered regarding using anti-freeze solutions more than one season. During use, anti-freeze is subjected to several conditions that cause it to change its properties. Inhibitors are depleted by several causes, including exhaust gas leaking into the cooling system. The gas, containing oxides of carbon, sulphur, and nitrogen, may react with some inhibitors, destroying their effectiveness. Small amounts of air leaking into the system hasten corrosion and may cause "gas erosion". The effects of air are much greater if the liquid level is allowed to fall low enough to cause entrainment of air as the coolant is pumped into the top of the radiator. Localized "hot spots" in the engine, such as the area around exhaust-valve heads, may also cause depletion of inhibitors.

The anti-freeze base material itself is subject to decomposition, with the formation of organic acids and aldehydes, which may react with the inhibitors. It is not feasible to predict the time when these factors will lead to corrosion in the cooling system of a given automobile



Sanding the commutator of a generator materially helps to maintain the charging rate, and insures longer brush life.

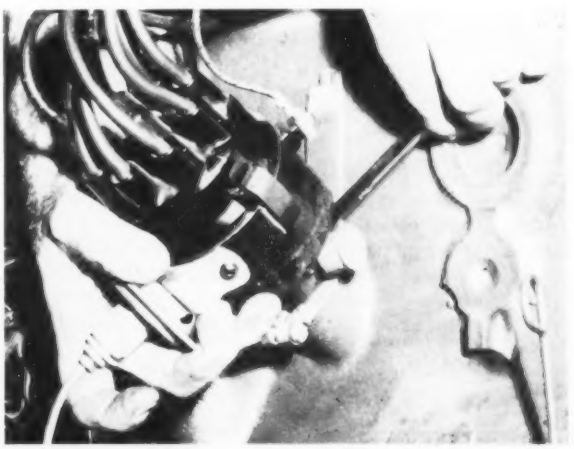
because of the various extent of each. It is certain, however, that corrosion products such as rust will eventually form if the solution is used beyond its useful life. Once corrosion begins it will proceed at an increased rate. In 2 to 50 percent of tests, the inhibitors were completely exhausted at 10,000 miles, depending on the formula being tested. In a recent survey of used anti-freeze it was reported that 20 percent of cars showed "high acidity and rust or deposits" in the cooling system at the end of the first year's use and "in the two or three year group . . . about 68% of the cars showed rust or deposits in the radiator." A chemical analysis of a used anti-freeze may tell how much inhibitor remains, but will not predict *how long* it will last.

"A filling of fresh anti-freeze may usually remain good for one winter. Anti-freeze left in the cooling system during the summer will be expected to deteriorate more rapidly under summer driving conditions."

After all, anti-freeze is a modest service cost to the customer and certainly much cheaper in comparison to the cost of replacement parts and labor in the event of a damaged engine due to a freeze-up.

When putting anti-freeze into the engine's cooling system abide by the instructions and suggestions of the anti-freeze manufacturer.

Listed under check points of Winterizing Service are items, which although not part of the cooling system, must be in good shape or working properly for satisfactory cold weather operation of customers' cars. Practically all of these operations in connection with the generating and starting system, ignition system, fuel control, exhaust, brakes and so on have been featured in previous



For easy starting and proper engine operation, winterizing must include correct timing of the ignition spark.

issues of AUTOMOTIVE SERVICE DIGEST. Since most service men are familiar with the detailed procedure, the items only are listed as a reminder.

In spite of the most painstaking winterizing work, every so often there comes along the "problem" cooling system with what appears to be a "mysterious" case of over-heating, even in cold weather. Should a customer "come back" after the car was winterized by doing the work as outlined under the 10 check points it is in order to check for:

a—Exhaust gas leakage into the engine water jacket.
b—Possibility of a loose or corroded water pump impeller.
c—Internal leakage of coolant.
d—Air being sucked into the cooling system on the suction side of the pump.

The service items referred to include substantially the "must" items in an orthodox winterizing program. Naturally other services often are appropriate—many of them being prompted largely by local conditions as to weather and snowfall severity.

Additional services might include, for example: Sale and installation of snow tires; heavy duty wiper blades; body work, painting, waxing, and installation of accessories which add to the comfort of winter driving, safety, easy starting and good all-around operation.

AC **SELLING *SLANTS***

MONEY-MAKING FACTS

Auto Care starts

AC's Five-Star Campaign

"Auto Care" is the basis of your replacement business . . . and this fall, AC is backing your sales efforts with strong five-star support.

First . . . a powerful, AC Advertising Campaign featuring the timely theme, "Auto Care Starts With AC!" It's being launched right now—right in your trading area.

Second . . . your fall tie-in for increased sales—AC's big dealer window display, starring "Sparky" done in bright, dimensional plastic.

And here's more big news . . . your AC FM-43-SP "Auto Care" Package contains a *really* hot sales starter . . . *the new, exclusive, all-plastic* AC *"Service Special"* display to provide point-of-sale merchandising of your own individual fall "Service Specials."

NEW PLASTIC "SERVICE SPECIAL" SIGN

A first-class sales builder . . . this impressive sign comes complete to you with 9 popular "Service Specials", 1 blank sign for your own write-in of an additional special, plus 5 sets of price numerals. It's a permanent all-weather sign in attractive colors . . . mounts in the service area, on a window or pump island. Truly a valuable merchandiser that will give you years of service!

OF THE MONTH !

FOR DEALERS

with AC SPARK PLUGS

to Boost Your Fall Sales!

New Plastic "Sparky" Window Display

An outstanding traffic stopper . . . "Sparky" formed in sturdy, deep dimensional plastic, flanked by supporting paper trim carrying the "Auto Care" theme. Display is suitable for either window or wall mounting. Plastic provides for extra-long display life.

Here's All You Do . . .

Order any 48 AC Spark Plugs and pay $8.24 for this valuable FM-43-SP Package. Included with the Package is an 8-Pac of AC Spark Plugs (Type 84TS) worth $8.24. When you sell the 8 spark plugs, you recover $8.24 . . . the profit from the sale of the 8-Pac pays for the Promotional Package.

Powerful "Auto Care" National Advertising Support

National Magazines . . . Special AC "Auto Care" Campaign ads appear in September and October issues of Life and Saturday Evening Post, reminding millions of motorists that "Auto Care Starts With AC!"

Outdoor Billboards . . . Over 5000 "Auto Care" Boards in every trading area of 25,000 people and up . . . delivering over 30 million reminder messages daily during the fall selling season.

Network Television . . . AC announces renewed sponsorship of ZORRO, the TV hit of the year from Walt Disney Studios over ABC-TV. Millions of ZORRO viewers every week will see and hear the sales producing AC "Auto Care" story.

● **CALL YOUR REGULAR AC SUPPLIER NOW!**

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

AC SELLING *SLANTS*

MONEY-MAKING FACTS

Auto Care starts

AC's Fall Campaign Loaded with "Sell"

10 beautiful pieces of Oneidaware to add to your set

Here it is . . . in response to thousands of requests . . . additional quality-crafted Oneidaware in the handsome matching "Profile" pattern. The deal's the same . . . Include $7.50 with your order for *any* 24 AC Elements. You receive the FM-41-OF Oneidaware Package which contains 3 *extra* AC Elements worth $7.50. When you sell the three AC Elements, you recover $7.50 . . . the profit from the sale of these 3 elements pays for the Promotional Package.

• *2-Piece (Spoon and Fork) Salad Mixing Set* • *4 Cocktail Forks* • *Cake Server* • *Pierced Relish Spoon* • *Pierced Serving Spoon* • *Gravy Ladle.*

Earlier AC Oneidaware Promotions are still available!

Miss the original deals? Now's your chance to get all 42 Oneidaware pieces. Ask for them by number . . . FM-31, Basic Set—four place settings: 4 knives, 4 forks, 8 teaspoons . . . FM-35, four settings of additional pieces: 4 soup spoons, 4 salad forks, 4 iced drink spoons, plus butter knife, sugar spoon, large serving spoon and fork.

OF THE MONTH !

FOR DEALERS

with AC OIL FILTERS

. . . Featuring Oneida Tableware!

Here's a double-action AC Oil Filter Campaign for AC dealers everywhere. First is the huge National Advertising Campaign, "Auto Care Starts With AC," aimed at car owners right in your neighborhood. Second, the campaign provides an opportunity for you to obtain 10 additional pieces of that tremendously popular Oneida Tableware.

Complete Your Set Now . . . The FM-41-OF "Auto Care" Package, including "Auto Care" Window Trim and Oneidaware, is available from any AC Supplier.

plus

FULL-COLOR "TRAPPER" WINDOW TRIM

"Trapper," the famous AC Oil Filter protection symbol is eager to go to work for you this fall under the "Auto Care" banner. This valuable tie-in trim comes with every FM-41-OF Campaign Package.

Business-building national advertising support! . . .

National Magazines . . . Full-Page AC "Auto Care" ads in Life and The Saturday Evening Post.

Outdoor Billboards . . . over 5000 during the fall months carrying the "Auto Care" theme.

Network Television . . . Action packed "Auto Care" commercials on ZORRO, Walt Disney Studios' great adventure series on ABC-TV.

AC Spark Plug ❀ The Electronics Division of General Motors

"So you want to open a service shop?"

It's like leaving home to "go on your own" the first time. Here's "boot training" for the ex-salaried-employe embarking on the tossing seas of independent enterprise.

Part VI—Salesmanship

By HERB CARRIER, Detroit Editor
and
DR. GEORGE A. FIELD, Wayne State University

• SELLING is a fine art. Without salesmen our whole economy would collapse. There are very few products, if any, which actually sell on sight. Ask an inventor. He may have come up with the world's best gadget—maybe it changes tires, cleans windshields and whistles "Dixie" all at one time. **But** no one seems to want to buy it.

Then, the inventor finally realizes why salesmen were born—and he runs to one post haste. Many times the sales end of the picture equals, or even surpasses, the production end in importance. This is further evidence that sales talent is an extremely vital asset in any business venture.

Your degree of success as an owner of an independent repair shop will be calibrated closely to your ability to sell. You must **research** all selling angles, **read** selling literature, and constantly **practice** the recommended techniques of selling.

Oddly enough, selling, **per se,** can be analyzed almost mathematically. It's somewhat like baking a cake. The ingredients are basic; but the amounts, the blending, and the mixtures vary according to the results desired.

The owner of a newly formed garage (or an established one for that matter) should know as many sales ingredients as possible, so that he can use them in any number of combinations to make sales in an infinite variety of different selling situations.

The basic ingredients of successful salesmen are: Sales Personality, Knowledge of Product, Knowl-

Cigar ashes in the tool box could lead to bloodshed *if* the salesman forgets a prime rule of selling. Think about punching the slob in the nose, but don't do it . . . just think and smile.

edge of Customer, and above all, **Knowledge of Salesmanship.**

Sales Personality: It's true that some people seem born salesmen. They're natural mixers; they're gabby; they like people, and have all the other necessary assets of good salesmen. In addition, they seem unconsciously to know how and when to apply their talents. Truely, such individuals are rare birds, indeed; and even the rarest of the rare, can be improved upon.

No matter how much ability a person starts with, he can improve. Take medicine or music, for example. Some people obviously have more native talent along these lines than others; yet even those most blessed must go through extensive, difficult training before they master their professions.

If a person of average intelligence took as much concentrated training in salesmanship as the doctor takes to get his M.D., he would be a tremendous success. Unfortunately, writing a sales order is not nearly as dignified as writing a prescription. People don't respect the selling profession nearly as much as the medical profession. The final result, of course, is nationwide low standards among salesmen. Most salesmen just get by, yet with increased knowledge and much hard work they could become outstanding.

The characteristics of a good salesman sound something like the Boy Scout Oath. This is good. If we expect boys to live up to high ideals, why not adults? Therefore, a good salesman is friendly, considerate, helpful, likes people, is a good listener and likes to sell. "So?", you say; well look at how this oath applies:

Friendly: Some mechanics are downright rude. This might be "just their nature." Maybe they fit into that group of "fine fellows, once you get to know them." An extended period of cool aloofness is definitely undesirable when trying to build up a service clientele—a warm, friendly manner is a must. Even when customers, or potential customers, seem to go out of their way to be "extra" annoying, the salesman is expected to keep his poise and dignity and not get involved in an argument. A friendly spirit is one way you can hope to avoid the common caustic comment of, "too independent."

Considerate: In most every selling situation, the **customer** is the center of the sale . . . not the product or the service. A little personal consideration for the customer's feelings and welfare will go a long way toward making sales.

Customer welfare involves many things. Maybe the customer is willing to have you do the necessary repair work to his car, but his wife is expecting and he needs ready transportation. He's in a real box. He wants a safe car; yet he can't afford to be without it. He **needs** consideration. In this case, a standby car, possibly your own, could be made available in the event of an emergency. No need to furnish a loaner —just assurance that the customer will have transportation to meet the situation.

True, not many customers are in this boat, but many of them do have comparable problems. In selling to them, try to uncover the source of their sales resistance. It's not always money. Quite often a little consideration can be a sales clincher.

Helpful: People like little favors over and above the call of duty. Helping a customer doesn't necessarily involve an emergency. It can amount to little more than extra, **personal** service. It could be a word of advice on car maintenance, a getting-together of customers for the purpose of forming a

(Continued on following page)

The "cold fish" stare is an effective sales dampener employed by some customers. Stare him down . . . gain his confidence . . . then sell him what he needs.

car pool, a public bulletin board where customers can pin notices of things for sale, wanted to buy.

These are all little—but noticed—ways in which you can be helpful. There are dozens of others. Make an effort to think of something novel and unique. Once you have found it, push it as a traffic-getter. Promote it — so that all your customers, and potential customers, know all about it. Make a point of being as helpful as possible to as many people as possible—it's good business.

Like People: If you don't already like people, now is a good time to start learning how. Learn to enjoy all kinds of people. The more you like them, the more they will like you—and the more they will patronize your place of business.

The "Show Me" customer should be shown. Give him the chance to inspect parts which you recommend he have replaced. Make sure he knows what he is being asked to spend his money for. Sell by being considerate and helpful . . . not through high pressure.

Dry type air cleaners are comparatively new to the general public. It's quite likely a large percentage of new car owners don't understand the service they require. Be considerate . . . give your customer a few helpful hints on how he can better protect his investment.

Beware, of course, of being tagged a "yes" man. The customer is always right, but he doesn't want to do business with a wishy-washy. One of the most successful garage owners in a certain community is known far and wide for his love of Barber Shop Singing. People inconvenience themselves to come to his shop. More often than not, they buy some service, but usually they manage to work into the conversation a remark about Barber Shop Singing being the lowest form of music. The garage owner objects violently, of course, and there follows a few words of spirited conversation concerning the pros and cons of it. Always though, it's a friendly argument. No customer leaves his shop in a huff. He makes many friends through his love of music, and finds many cash customers among them.

His one big shortcoming is being too social. He's almost too friendly. People tend to hang around his shop just because they enjoy his conversation and because he is such a likable guy. There's danger in this too. Don't go overboard in the "good Joe" department to where you find yourself running a hangout. Temper your businessman's efficiency with a goodly amount of friendliness, but not too much.

Good Listener: The most common mental picture the general public has of salesmen is that they are all fast talking, high pressure con men. Unfortunately, many salesmen do attempt to sell this way; but these are the ones who either don't know their business, or who are in the few isolated situations where that kind of selling pays off. It doesn't work in the repair shop.

A good salesman listens more than he talks. People like to be heard. Most of the time they are having trouble with their cars and want to talk about it. If allowed to talk long enough, some customers diagnose their own trouble and suggest the service they need. Most likely they'll be wrong, but they actually sell themselves on the idea of getting the car fixed. Trying to out-talk this kind of customer is a sure way to lose the job order.

Let them talk, but don't let them wander. Occasionally a customer starts out by telling of his trouble with his car. This reminds him that Uncle Harry had the same kind of trouble with his Essex. Incidentally, he adds, Uncle Harry was a milkman. He made side money by siphoning the cream off the top of the quart bottle and filling them with water. Then he'd put the cream in bottles and sell it. Wasn't very sanitary was it? Incidentally, (here we go again) the local dairy has a new method of sterilizing their bottles, etc. etc. etc.

This kind of customer is expensive. The amount of your time he wastes bending your ear about nothing in particular could much better be applied to profitable labor. Let him talk, but keep him on the right track.

Listening, incidentally, is the best and quickest way to get to know your customers. Knowing them is basic to selling them.

Like To Sell: A good salesman is "sales minded". He has self confidence and self respect. He knows that he is performing one of the most vital services in our entire economic set-up. He **likes** to sell. Constantly he looks for selling opportunities. He sensitizes himself to them. If he doesn't have the natural tendency to feel these things, he studies all

available literature on the subject. He thinks about it. He acquires it in any way he can. Then he applies it.

The traffic that drives passed his door is not just so many vehicles, but it's opportunity. Practically every car on the road—about 67 million units—needs some kind of service. Your job: Find it, Sell it. This requires thinking of yourself as a salesman, as well as a technician. It can be a tough assignment, but plenty of other people have done it. It leads straight to success.

KNOW THE PRODUCT

Most salesmen don't know the products they sell, or are trying to sell. To test this, walk into any drug store. Select a well displayed item and say to the clerk, "Is this stuff really good for poison ivy?". The clerk will invariably take the item in his hand and read the label—usually aloud. He'll struggle through six syllable medical words, shrug his shoulders and say, "Guess it is. It says so right on the label".

Customers subjected to this kind of selling quickly lose confidence in the salesman's knowledge and walk away without buying. The thousands, or even millions of dollars the pharmaceutical corporation has invested in research, development, manufacturing, distribution, display and advertising are wasted because the clerk didn't follow up at the point of sale.

Customers want assurance. Any salesman could increase his sales by acquiring a more thorough knowledge of what he is selling. In the case of an independent service shop, it's important to know as much as possible about the products being handled. This knowledge can be gained by reading sales literature, talking to the distributor who sets up the displays; by studying the advertising that accompanies and supports the product. It's necessary to know what you are selling; to be convinced that it is well worth the customer's money. Then sell it.

If salesmanship were compared to a rifle, product knowledge would be the ammunition. Knowing the product will help build your own enthusiasm. Almost every product you handle will have some outstanding features. Learn them. Talk them. Sell them.

KNOW THE CUSTOMER

This is more important than knowing the product, though many salesmen stop with product information. That's like a duck hunter learning all about hunting clothes, guns, hand warmers, etc., but neglecting to learn anything about ducks. Or the lion tamer who learns all about whips and cages, but doesn't study the lion. The popularity of this kind of lion tamer rates high among lions, but low among circus owners. Salesmen who don't study their customers either give up selling, or become awfully thin from grazing on poor pasture.

Take an interest in each individual customer.

There'll be times when a customer just won't go for replacement parts, even when he knows he needs them. Again, it's the salesman's responsibility to see that his customers get the service they want. There's no alternative . . . go along with a cleaning and an adjustment and hope to get the replacement sale later.

Greet him with the sweetest sound in the world—his name. Express an interest in his dog, his hobbies, his car, or his job. Do this without being nosy. Again, encourage him to talk. Show a genuine interest in what he says. Don't toss off his favorite topic with a cool, disinterested "Izzat so." People are the most complicated and the most interesting things in the world. Success comes from learning to understand them.

By developing the habit of analyzing your customers as individuals, you will learn what makes them buy. Everyone has a different pattern of interest and desires. Some want money, others security. Some want fame, others want privacy. A few want everything. Individual patterns of desire are the keys to selling. Make a real effort to know what each of your regular customers wants out of life. Learn the small things as well as the big things. It's a tremendous field. Books have been written on the subject, and still many new facets of the problem pop up each day.

TIP-OFFS TO SALES

In the service business, buying patterns can often be deduced by association. For example, if a customer shows an interest in dogs, has one or more in the car most of the time, he's a likely prospect for seat covers. If he's a fisherman, sell him a waterproof flashlight, or a tire pump that can do double duty for inflating collapsible boats. If a customer has children, especially small children, sell him safety locks for his four-door automobile. If he's single, but likes girls, sell him appearance accessories, vanity mirrors, cleansing tissue dispensers.

Tag every customer as an individual bundle of habits and desires that make him prospect for

(Continued on page 78)

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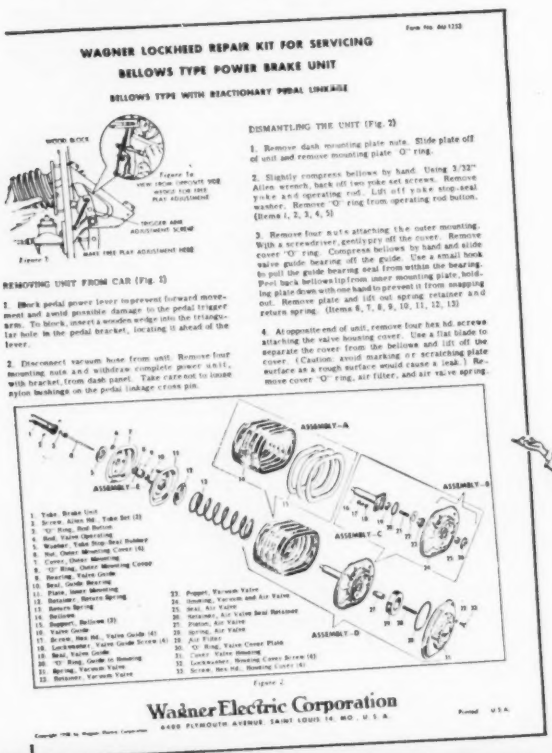
POWER BRAKE REPAIR KITS

the only complete line on the market

ALL FROM ONE SOURCE—Now you can obtain all of your power brake repair kits from one dependable source of supply and backed by the Wagner Lockheed reputation for quality and performance.

GROWING MARKET—This year more than one out of four passenger cars manufactured is equipped with power brakes and the total is growing. Improve your brake service immediately with this complete line of repair kits. Only Wagner can supply you with kits for all makes and models of passenger cars.



WAGNER LOCKHEED REPAIR KIT FOR SERVICING
BELLOWS TYPE POWER BRAKE UNIT
BELLOWS TYPE WITH REACTIONARY PEDAL LINKAGE

REMOVING UNIT FROM CAR (Fig. 1)

1. Block pedal power lever to prevent forward movement and avoid possible damage to the pedal trigger arm. To block, insert a wooden wedge into the triangular hole in the pedal bracket, locating it ahead of the lever.

2. Disconnect vacuum hose from unit. Remove four mounting nuts and withdraw complete power unit, with bracket, from dash panel. Take care not to loose nylon bushings on the pedal linkage cross pin.

DISMANTLING THE UNIT (Fig. 2)

1. Remove dash mounting plate nuts. Slide plate off of unit and remove mounting plate "O" ring.

2. Slightly compress bellows by hand. Using 3/32" Allen wrench, back off two yoke set screws. Remove yoke and operating rod. Lift off yoke stop-seal washer. Remove "O" ring from operating rod button. (Items 1, 2, 3, 4, 5)

3. Remove four nuts attaching the outer mounting. With a screwdriver, gently pry off the cover. Remove cover "O" ring. Compress bellows by hand and slide valve guide bearing off the guide. Use a small hook to pull the guide bearing seal from within the bearing. Peel back bellows lip from inner mounting plate, holding plate down with one hand to prevent it from snapping out. Remove plate and lift out spring retainer and return spring. (Items 6, 7, 8, 9, 10, 11, 12, 13)

4. At opposite end of unit, remove four hex hd. screws attaching the valve housing cover. Use a flat blade to separate the cover from the bellows and lift off the cover. (Caution: avoid marking or scratching plate surface as a rough surface would cause a leak.) Remove cover "O" ring, air filter, and air valve spring.

ASSEMBLY—A
ASSEMBLY—B
ASSEMBLY—C
ASSEMBLY—D

Figure 2

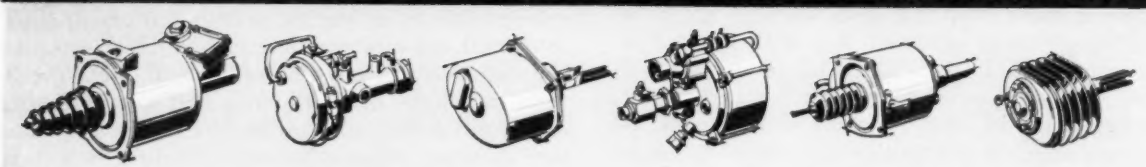
Wagner Electric Corporation
6400 PLYMOUTH AVENUE, SAINT LOUIS 14, MO., U.S.A.

LOOK AT THESE FEATURES!

- New complete line covers all passenger cars and is available only from Wagner.
- Selection of kits includes single package unit, major kits, minor kits, packing kits, and poppet valve kits.
- Complete line backed by famous Wagner Lockheed reputation for quality and performance.

Each power brake repair kit includes an easy-to-follow how-to-do-it instruction sheet with all parts named and identified. In addition, it shows the steps to be taken in disassembly and assembly of all sub-units and components.

COMPLETE COVERAGE FOR ALL MAKES AND MODELS OF PASSENGER CARS



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POWER BRAKE repair job

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AUTOMOTIVE TECH KNOW-HOW

By HERB CARRIER
Detroit Editor

Fuel control systems

Converting liquid gasoline into mechanical energy involves more than carburetion. Air filters, manifolding and exhaust systems — all play an equally important role in providing efficient, economical engine operation from tank to tailpipe under constantly changing conditions.

Part II—Problems of the Refiner

• GASOLINE WAS THE DIRECT cause of reducing our nation's population of horses and mules from 25 million in 1920 to about 5 million in 1958. Horse lovers might call this mass extermination. Farm boys with shovels undoubtedly have another term for it. Like it or not, the twenty million animals have been replaced by about seven million trucks and tractors. In addition, approximately 60 million passenger cars are currently in use in this country. Add these figures to the number of aircraft, prime movers, and even power lawn mowers, and places where gasoline is used are phenomenal. *Every minute* of *every day*, 100,000 gallons of gasoline are consumed.

COMBUSTION

Burning gasoline in the cylinders of an automotive engine so that the most satisfactory performance possible is obtained has been, and probably always will be, a major goal of the petroleum and automotive industries alike.

The manner in which gasoline burns within a cylinder can be compared to a flame moving across a field of dry grass. It takes time for either the gasoline or the grass to completely burn. Neither burning process is instantaneous.

The speed of gasoline combustion varies directly with the density of the fuel, the air-fuel ratio, and the turbulence created by engine design. These factors can cause flame speeds from as slow as 20 feet per second to well over 150 feet per second.

The heat generated by the burning fuel mixture causes the gases to expand. In the confines of the combustion chamber, the immediate expansion results in a pressure increase that can spring from 160 pounds per square inch to about 600 pounds per square inch.

In an average engine, this can mean that each piston can carry a momentary force of three to four tons. This pressure should be applied to the piston as a steady push, forcing the piston down smoothly and evenly.

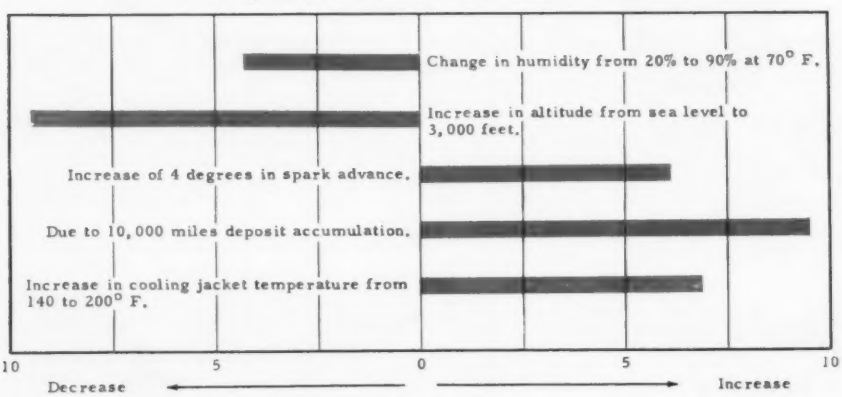
Normal engine design permits peak cylinder pressures to occur within 10 to 15 degrees after top dead center. Under light load, flame may exist in the cylinder for as long as 60 degrees of crankshaft revolution.

DETONATION

In all situations, the mixture within the combustion chamber burns very unlike the field of grass. Occasionally, detonation will occur. Detonation can be explained as an explosion rather than a burning.

For example, the fuel-air mixture in a given cylinder may be ignited by the correctly timed firing of the spark plug. The mixture begins to burn normally, and the flame starts to move away from the plug. During burning, the pressure and temperature are increasing rapidly. A point is reached where the increased heat and pressure become too great for the unburned fuel—that part not yet reached

Average Effect of Variables on Octane Requirement


Change in humidity from 20% to 90% at 70° F.
Increase in altitude from sea level to 3,000 feet.
Increase of 4 degrees in spark advance.
Due to 10,000 miles deposit accumulation.
Increase in cooling jacket temperature from 140 to 200° F.
10
5
0
5
10
Decrease
Increase

Many factors influence the octane requirement of a given engine. In addition to those mentioned in the chart (left), design tolerance can cause an octane requirement variation of as much as 10 octane members in identical engines.

by the spreading flame—to stand. When this happens, the entire remaining amount of unburned mixture violently explodes. The resultant noise is heard as a sharp rap, which has been called fuel knock, spark knock, carbon knock, ping, etc. A more engineeringly correct definition of detonation is an uncontrolled explosion of the last portion of the burning mixture within the combustion chamber.

Severe or prolonged detonation can cause major mechanical failure to the engine. Sledge-hammer blows can be exerted on the top of the pistons by the surge of extra pressures developed in each cylinder by the detonation. Broken pistons are very often caused by detonation.

Detonation can also cause overheating of engine parts such as valves, spark plugs, and pistons. Overheating, in turn, can lead to preignition (igniting the fuel-air mixture before the spark plug fires) which can cause physical damage to the pistons.

PREVENTING DETONATION

One of the most effective ways to prevent detonation is to use a fuel of sufficient antiknock quality, or in other words, higher octane fuel.

The octane number of a gasoline is a term that is generally bantered about, but not too often understood. Literally, octane numbers refer only to a fuel's ability to resist detonation during combustion. An explosion of 100 octane gasoline is no more powerful or dangerous than an explosion of 40 octane gasoline.

It is true, however, that greater power can be obtained from high octane fuel because it can be more highly compressed than low octane fuel. Compression ratio has a direct relationship to power and to fuel economy.

ASSIGNING OCTANE NUMBERS

A gasoline of unknown octane can be assigned an octane number through testing by any one of several approved methods. Basically, a test of the unknown fuel is made on a single cylinder gasoline engine. The engine is equipped with a knockmeter used to determine a point of reference. The fuel-air mixture ratio is adjusted to produce maximum knock, and the variable compression engine is adjusted to produce a level of knock intensity which will record as 55 on the knockmeter. The unknown fuel is then compared in knock intensity of various reference fuels which are blends of isooctane (practically knockless) and normal heptane (knocks severely).

If a blend of 80 per cent isooctane and 20 per cent heptane is required to duplicate the knock intensity of the unknown fuel, the fuel is assigned an octane number of 80. This is a typical test; there are, however, other similar methods of determining octane number.

Take 20 vehicles right off the assembly line, all with identical power plants, and it's very possible to find engines whose octane requirements vary as much as 10 octane numbers. Premium gasoline will satisfy about 90 to 95 per cent of all cars on the road. Regular gasoline will satisfy about 50 to 60 per cent.

Atmospheric pressure, relative humidity, air temperature, lube oil, fuel characteristics, spark timing, distributor curve, intake manifold temperature, engine age,—all are among the factors which can influence required octane, along with engine design including compression ratio. Full value of high octane fuel can only be obtained in engines that are designed and adjusted to take advantage of it. High octane (95) gasoline used in a 4.5 compression ratio engine is a waste of money. The engine will probably perform just as well on low (55) octane fuel.

A fairly accurate method of determining octane requirement of a particular engine can be made by road testing the vehicle and using the human ear as a low knock intensity measuring device. Through consistent testing, it's possible for an owner to determine which octane fuel is best suited for his engine. Of course, other factors such as mileage and performance should also be evaluated.

Having an appreciation of the chem-

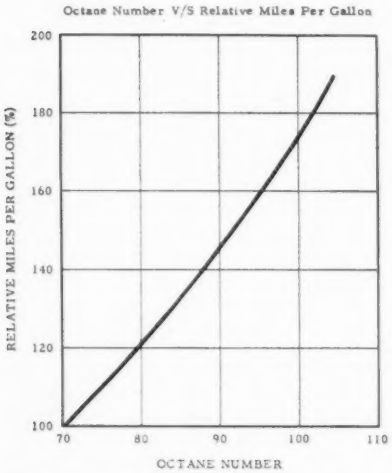
(Continued on following page)

Typical refinery scene. Thousands of such refineries turn out billions of gallons of gasoline annually. Note the catalytic cracking tower in the center of the picture near the railroad track. The entire refinery area is interlaced with underground pipe carrying materials to storage tanks, blending tanks, etc.

ical process and the technical exactness of producing high quality gasoline can't help but produce a greater respect and appreciation of the industry which produces food for our 8 billion horsepower. In many ways the petroleum industry has literally changed the face of America.

MAKING GASOLINE

Crude oil, as it comes from the ground, is a mixture of thousands of different chemicals. In color, the liquid may be black as tar, or as clear and



Relative miles per gallon of gasoline increase considerably when the octane number of the fuel is increased. This applies only to engines that are designed to take advantage of high octane gasoline. 95 octane fuel in a low compression ratio engine doesn't necessarily mean increased mileage or performance.

colorless as water. This depends upon the particular oil field from which it comes.

Separating the chemicals, altering their chemical structure, and making useful products from them, is no small project. Petroleum refiners spend great sums of money annually in machinery, equipment, research and development to find better methods of producing products of increasingly higher quality.

Crude oil, in effect, can be compared to the product of a given gravel pit that yields earth material in sizes varying from fine sand to baseball-like rocks. A convenient and efficient method of culling this multi-sized mass is to pass it over a screen with progressively larger holes. The sand falls out first. Next the pebbles drop out. Finally the large rocks are left.

In theory, this is one way by which the different hydrocarbons can be separated from the bulk fuel oil. The screen is replaced by a "bubble tower." A typical tower consists of a huge vertical drum, inside of which 20 to 30 trays are arranged one above the other about two feet apart.

Crude oil—heated to about 750°—is pumped into the lower part of the drum about six or seven trays from the bottom. At this temperature, a good part of the crude oil turns to vapor. The vapors rise in the tower through small holes in each tray.

The vapors continue through each tray until they reach a point in the tower where the temperature is low enough to cause the vapor to condense into liquid and fall into a waiting tray.

By this process, as you can see, the furnace oil vapors begin to liquefy in trays close to the bottom of the tower, while the kerosene vapors condense in trays a little higher up. Gasoline vapors do not condense in the tower; they pass off the top into a dome shaped condenser, where they liquefy into straightrun gasoline.

Again according to source of crude oil, the octane number of the straightrun gasoline varies. It can be lower than 20 in some cases, higher than 60 in others.

Simple distillation of crude oil in 1900 resulted in about 10 per cent gasoline. In other words, if a refiner started out with 100 barrels of crude, he'd wind up with 10 barrels of gasoline—plus, of course, a certain amount of other products and residue.

By 1914, gasoline uses jumped to where 20 per cent of a barrel of crude oil was required to meet the demand. When World War I broke out, there were not enough gasoline hydrocarbons in crude oil to produce the quantity of badly needed gasoline.

THERMAL CRACKING

Chemical engineers went to work on the problem and came up with a cracking process to step up the number of available gasoline hydrocarbons. Let's go back to our gravel pit analogy to see how this cracking process works:

Picture again the multi-sized gravel coming from the pit and being placed in a hopper before it is conveyed over the sorting screen. Remember that the purpose of the screen is to separate the gravel into sizes, just as the bubble tower separates the various chemicals in the crude oil.

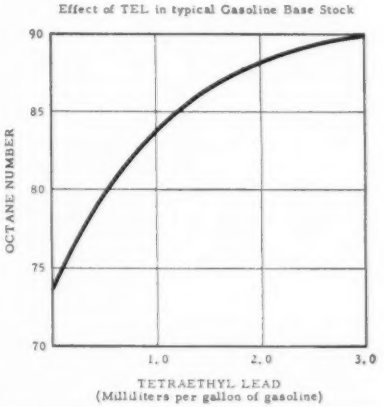
Now, *before* the gravel is allowed to pass over the screen, it is run through a rock crusher. This grinds up the big stones so that after screening it's possible to wind up with many more small stones, and few if any large stones. In this case, we've actually *cracked* the gravel before screening it.

What happened to the large stones in the gravel when they went through the grinder is comparable to what happens to the heavy fuel oil hydrocarbons in the crude oil, when they are subjected to heat and pressure. They are cracked into gasoline hydrocarbons. Naturally, this results in more gallons of gasoline per barrel of crude oil.

Early cracking processes enabled refiners to extract at least 30 per cent of gasoline from an average barrel of crude. And the gasoline obtained was higher in antiknock quality. By 1937 about 44 per cent of crude oil was being made into gasoline. Approximately 52 per cent of the gasoline obtained was straightrun, and 48 per cent was cracked.

CATALYTIC CRACKING

World War II again jumped demand for higher octane gasoline . . . this time to where neither distillation nor thermal cracking could meet it. So once more, chemical engineers came



With the addition of 3 milliliters of TEL per gallon of gasoline it's possible to raise the octane number of a typical gasoline from about 75 to 90. Generally, low octane base stock will respond greater to TEL than will higher octane base stocks.

up with an improved process of obtaining gasoline from crude oil.

Instead of using heat and pressure to crack the crude oil (thermal cracking), engineers developed a process by which the cracking was brought about by chemical reaction through the use of acids, acid-treated clays, or compounds containing aluminum, molybdenum, nickle, platinum, silica, etc. This they termed *catalytic cracking.* (A catalyst is a chemical which causes a desired chemical reaction to take place even though it does not necessarily take part in the reaction.)

Very high quality gasoline can be obtained by the catalytic cracking method. In general, catalytically cracked gasoline has a high octane number—up to 94 by one testing method—and good blending char-

acteristics with other gasolines.

Various additional technical refining processes are currently in use, by which many undesirable features of raw gasoline are either removed or inhibited. Also, scientific treatment results in a tailored kind of gasoline that can satisfy the normal demands of gasoline engines in almost any situation.

TETRAETHYL LEAD

One of the most outstanding additives applied to gasoline is the antiknock compound. TEL (abbreviation of tetraethyl lead), the active ingredient of antiknock compounds, increases resistance to knock when added to otherwise finished gasoline in controlled amounts. The more resistance a gasoline has to knocking, the higher will be its octane number.

An average concentration of TEL is about 1 teaspoonful per U. S. gallon. Gasoline's response to TEL determines how many octane numbers the gasoline will be raised by the addition of TEL. The response is determined entirely upon the nature of the hydrocarbons in the gasoline: generally, gasolines derived from lower grade stock respond best. A satisfactory response is considered to be 5 to 10 octane numbers with the addition of 3 milliliters of TEL.

The value of TEL in increasing octane numbers is important to car owners in that higher octane fuels can deliver greater power and economy when used in suitable engines. TEL is also a convenient tool for the gasoline manufacturer. It enables him to supply high octane quality at low cost, maintain uniform quality regardless of fluctuations in the quality of his base stock, and it allows him to meet a sudden competitive octane increase without extensive changes in his refining methods.

"While you're at it, would you mind checking the battery and the radiator?"

(NOW PELLETIZED)

Only BAR'S LEAKS

MOST WIDELY USED COOLING SYSTEM PROTECTIVE IN THE WORLD

is FINE enough to Flow through the newly designed Cooling System and Car Heater tubes (23/1000 to 70/1000 inch) in modern cars.

*BAR'S LEAKS designed with aluminum in mind

U. S. Patent 2580719 Canadian Patent 501547, Other Patents applied for

ON ANTI-FREEZE CHANGEOVER

● For top engine performance, use BAR'S LEAKS or its affiliate, BAR'S RUST (same Pat. No.). Flush out and pour in bottle of BAR'S. If leaving antifreeze in from year to year, use BAR'S RUST to rejuvenate the coolant and protect system from corrosive acids. For late cars — '56-'57 on — use BAR'S RUST

HEATER CORE 23/1000 IN.

RADIATOR CORE 70/1000 IN. IN MODERN CARS

WARNING!

SERVICE STATIONS — DEALERS

Only BAR'S LEAKS meets the cooling system specifications of every automobile manufacturer as to fineness of ingredients and required protection.

Be on the alert! Many other sealer inhibitors contain coarse, bulky material. They clog the tiny new-car tubes of radiators and car heaters (23/1000 to 70/1000 inch). Fail to circulate. Fail to protect. As a result, aluminum components become pitted, harmful rust and scale develop, and seepage endangers vital metal parts. Remember, if you ruin a car, you're responsible.

Improved BAR'S LEAKS, now pelletized, dissolves to particles 15/1000 inch and smaller. BAR'S LEAKS circulates freely through the smallest heater and radiator cores. Only BAR'S LEAKS provides the required protection — inhibits rust and scale — seals all leaks in gaskets and porous metal. BAR'S is a *MUST!* Write for literature. Tells how you can qualify as a certified cooling system expert.

Cash in on BAR'S for a lucrative repeat business. LIST PRICE $1.00
Available through automotive jobbers, service stations, auto goods stores.

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Servicing the Renault Dauphine

General knowledge of the design, observance of necessary clearances, tolerances and torquing specifications opens the door for custom or general maintenance applicable to this small import motor car.

By E. S. HARRIS
Field Editor

Part II of a feature series

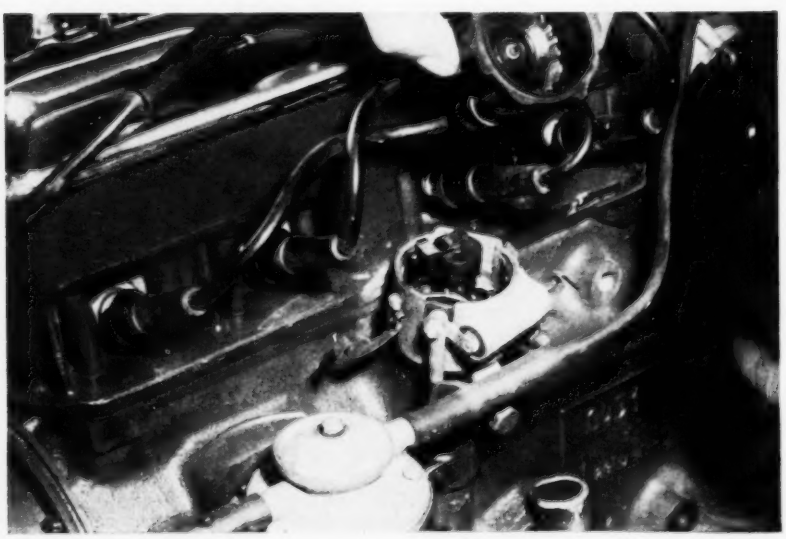
● THE RENAULT NAME is an old one in the automotive history of France, and Renault products have been reaching the automotive market in the United States since as far back as a half century ago. But while imports of the past were rare enough to stop traffic, present models of the Dauphine and its smaller sister, the 4CV, are reaching our market in quantities second only to the Volkswagen in the foreign economy car field.

The 4CV was the original US import model, but the larger Dauphine is the more popular member of the team at this time. So we will discuss the servicing of this model, which is more likely to reach your shop in sufficient numbers to require the knowledge and tools for proper servicing.

As in the case of many of the economy cars (and sports cars) rolling down our streets and highways, the owners have equipped themselves with considerable technical knowledge. Their desire for general service or for experimenting, is likely to result in a profitable new service market for the shops willing and able to do the job.

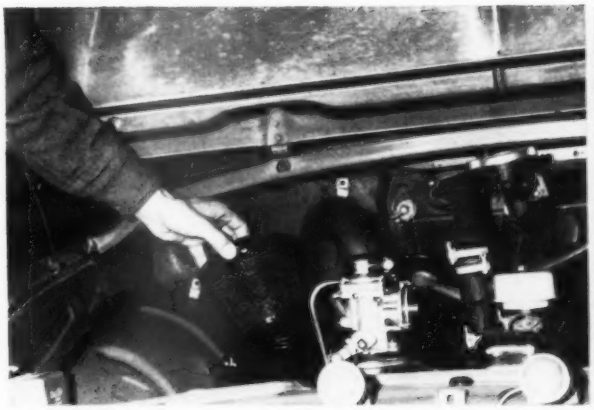
The Dauphine is equipped with a water-cooled engine located in the rear compartment over independently sprung rear wheels. Coil springs are used on both front and rear, and the hydraulic brakes by Lockheed are fed from a reservoir jar to the right of the battery in the front compartment. The handbrake operates the rear shoes mechanically. Hub caps are removed by backing off the center stud to disclose three lug nuts that attach wheel to hub.

Fuel pump has a priming lever that operates diaphragm by finger pressure when desired.

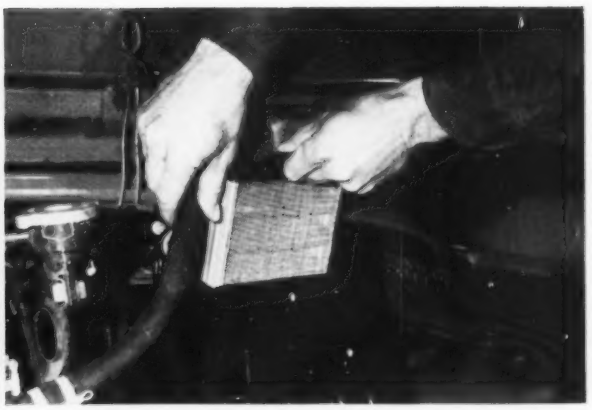


Standard equipment clutch is conventional; but for $110 extra the optional Ferlec clutch is available in which case only a brake and throttle pedal are evident. A three-speed transmission operates from a floor lever and is standard shift. The Dauphine weighs only 1,397 pounds unloaded, has an 89″ wheelbase.

Two types of distributors are used on the Dauphine, but either is simple to service.



Air filtering element is removed after loosening snap clips securing filter cover.



The car heater is located in the engine compartment and contains a filter element which can be lifted out.

A 6-volt electrical system is employed; the ignition switch starts the engine and also locks the steering. The horns operate separately or together, town-and-country.

While metric wrenches are necessary for servicing the Dauphine, the operations are simple and will pose no threat for any practicing shop or mechanic. A general knowledge of the design, clearances, tolerances and torquing is all that is necessary to put him in business.

While all light services are routine, there are imported power kits and supercharging kits which some owners may call on their shop to install. Additional instruments like ammeter or tachometer may be desired and can be installed simply and profitably. Ordinarily, the lead wires from instruments to engine are more easily run along the headlining and over the doors where they are safe from rubbing and water.

Carburetor choke adjustment is made for season as in many domestic cars.

When an accessory ammeter is installed, battery lead is removed from starter switch and a new lead run from regulator to ammeter.

ENGINE SERVICE

The Ventoux engine in the Dauphine is simple in construction; yet there are a few cautions to be observed to avoid trouble. The steel valve seats are shrunk fit into the aluminum cylinder head. To avoid warpage, the head should not be removed until the engine is completely cooled. The cylinder head gasket is installed with the oil holes on the ignition side and the water circulation hole on the #1 cylinder side. Inserts are available when threads in the spark plug holes are damaged.

After the head has been removed the crankshaft should not be turned, since the cast-iron cylinder liners may be moved out of their seats, perhaps causing leakage after the head is replaced.

Cylinder head bolts or nuts are tightened in sequence from center outward in each direction, to 44 ft. lbs. The engine is then run three minutes, and the bolts retightened in the same sequence. After the engine has been driven moderately for 20 minutes, retighten again. The engines using head bolts use four different lengths and bolts must be used in proper holes. The rocker arms should not be installed until the head has been replaced so the push rods won't be distorted.

Cylinder liners can be lifted out when the cylinder head is off (shims should be kept with liner). Beginning with engine #5643, the liners are fitted .003″ to .005″ above the block. Fit dry by adding or removing shims, use no cement. Rap with wood block to seat firmly. Replacement sleeves and pistons are serviced in sets and are kept in matched sets. Rods and pistons are also removed from the top.

The main bearings are of the thin

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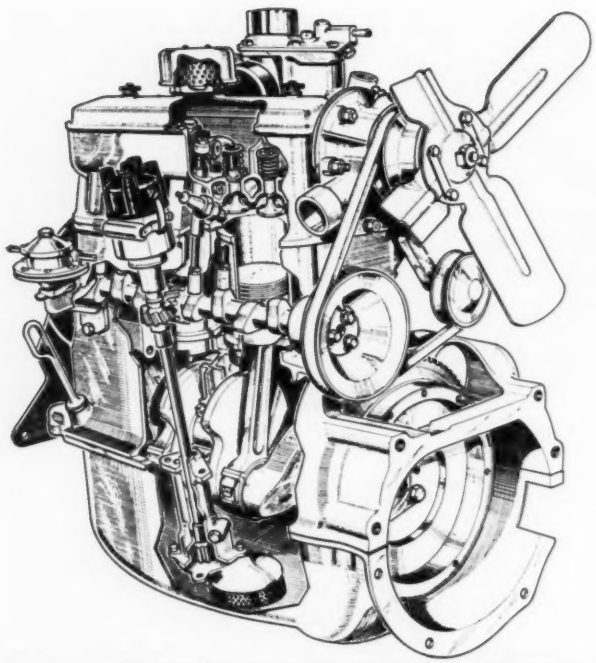
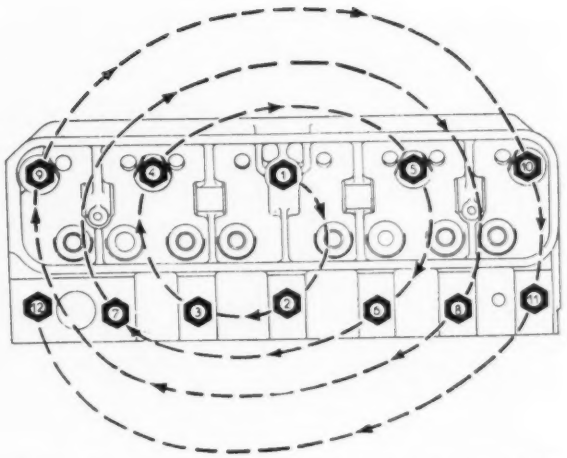




Above: Correct tightening sequence for cylinder head bolts. Cylinder head re-tightening must be followed by a valve adjustment.

Left: Cut-away view of the Type 670-1 Dauphine engine. Cylinder head is aluminum alloy, the allowable distortion of the milled face being .0019".

DAUPHINE SERVICE SPECIFICATIONS

GENERAL SPECIFICATIONS

Length, Overall	153"
Width, Overall	60"
Height, (Curb Wt.)	55¾"
Wheelbase	89"
Front Tread	49"
Rear Tread	48"

CAPACITIES

Cooling System	4½ Qts.
Engine Oil	2½ Qts.

ENGINE SPECIFICATIONS

Number of Cylinders	4
Horsepower (Taxable)	5
Brake Hp. @ —4200 rpm	32
R.P.M. (Maximum)	4700
Bore	2.28
Stroke	3.15
Piston Displacement	51.5 cu.in.
Compression ratio	7.25
Firing Order	1-3-4-2

CYLINDER HEAD

Bolt tightening Torque ..... 44 ft. lbs.
(Retighten when engine is cold after 20-30 miles road test)

VALVES

Stem-to-Guide Clearance	
Intake	.001"-.002"
Exhaust	.001"-.003.7"
Valve Lift — Intake	.226"
Exhaust	.236"
Rocker Arm-Valve Stem Clearance	
Initial (Cold) Intake	.006"-.007"
Exhaust	.008"
Permanent setting after road test	
Intake	.004"-.006"
Exhaust	.008"

CONNECTING RODS

Piston Pin Bushing, Diameter	.551"
Side Clearance	.002"-.0066"
Torque, cap bolts	25 ft. lbs.

CRANKSHAFT AND MAIN BEARINGS

Crankshaft end play (Center bearing)	.002" to .010"
Torque, Main Bearing Bolts	40-50 ft. lbs.
Torque, flywheel Bolts	33-36 ft. lbs.

CYLINDER LINERS

Bore	2.283"
Protrusion from top of block	.003"-.005"
Thickness, bottom seal	
Standard	.035 or .037"
Repair Size	.039" or .041"

OIL PUMPS

Pressure: 28.4 psi @ 600 rpm. 39.8-42.6 psi @ max. speed.	
Pump to engine ratio	½
Relief valve spring, free length	1.614"

CLUTCH

Single disc, dry type	
Disc lining thickness	.270"
Pedal free play	¾"

GEARBOX AND REAR AXLE

Gear Box Ratios:

Low—3.7	High—1.07
Second—1.8	Reverse—3.7

FUEL SYSTEM

Carburetor—Solex, Type 28 IBT	
Inlet and Exhaust Manifolds:	
Attaching Nut Torque, Center	14 ft. lbs.
Attaching Nut Torque, Ends	11 ft. lbs.
Fuel pump pressure	2-2½ lbs.
Torque, Ring Gear to Housing	
26 ft. lbs. until N°3421	
35 ft. lbs. from N°3422 up	

ELECTRICAL EQUIPMENT

Generator	
Charging Rate—22-24 amps @ 6.6 volts	
Commutator Out-of-round (Max.)	.0008"
Shaft End Play—(Max.)	.012"
Regulator	
Cut-in speed	800 rpm.
Distributor	
Either S.E.V. or R.B. U4:	
Shaft End Play	.007"-.0011"
Breaker Point Gap	.016"
Max. Advance	30° @ 4000 rpm.
Spark Plug Gap	.016"-.020"

FRONT AXLE & STEERING

King Pin inclination	10°
Camber Angle	1°20'
Caster	10°
Toe-In	1/8"-3/16"
Turning radius	15'

SUSPENSION, FRONT

Spring, free length	8.150"
With 386 lb. load	6.772"

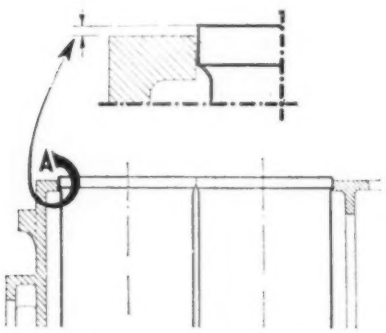
SUSPENSION, REAR

Spring, free length	10.315"
With 551 lb. load	8.583"

BRAKE SYSTEM

Master Cylinder, inside diameter	.870"
Front Wheel Cylinder, inside diameter	.870"
Rear wheel cylinder, inside diameter	.750"
Linings:	
Primary lining length	9.840"
Secondary lining length	7.670"
Thickness	.197"
Width	1.180"
Pedal free play (Normal)	¾"
Fluid level, from top of reservoir	¾"

wall type with no matching or scraping required. Rear bearing screws are $2\frac{5}{8}$" long, the front and center are 2-1/16" in length. The crankshaft endplay of .002" to .010" is checked with a dial indicator. Center bearing flange, available in oversize thickness, controls endplay. Clutch spring longitudinal thrust is taken by anti-friction metal covered steel discs located on center bearing.



Cylinder liner must protrude .003" to .005" (A) from assembly face before tightening head.

Camshaft end-thrust is taken by a brass flange on the cylinder block behind the camshaft pinion. Assembling check marks are punch marks, two punched on the camshaft pinion and one on the crankshaft drive gear, set to match marks on idler gear.

Tappet diametrical clearance is .0008" to .0017": replace with oversize tappet when clearance exceeds .004" (three oversizes available).

Valve, exhaust, stamped with letter E. Seat width .091"; stem diameter .2362"; clearance in guide .001" to .003".

Valve, intake, seat width .091", clearance in guide .001" to .002".

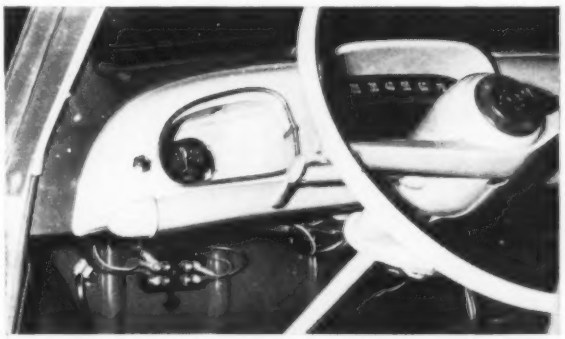
Valve adjustment, cold, for clearance to set valve timing: intake .006"-.007"; exhaust .008". Valve spring, free length 1.50", loaded under 15 lb. 1.22"; loaded under 30 lb. (valve open) .944".

Valve timing inlet opens 6° BTDC; closes 30° ABDC. Exhaust opens 45° BBDC; closes 7° ATDC.

CARBURETION

Some Dauphines have the 28 mm Solex carburetors, others have the 32 mm Solex with the automatic choke. The automatic choke type does the starting job itself; pumping the throttle to help things along doesn't assist in the least. Those interested in souping up these jobs change to either the 32 mm carb or a similar Carter carb, allowing for jet changes or adjustment. The small distributor is sometimes exchanged for the larger type used on the Renault "Fregate" when souping is the order.

Superchargers and power kits are available for edging up the power for the Renault owners desiring the extra oomph and willing to stand the expense. Other alterations leading to more power and better performance include enlarging intake and exhaust valve ports, taking care to align them with the openings in the manifold so gas flow turbulence will not result. Stiffer valve springs are installed, larger valves can only be used if the equipment for shrinking and installing valve seats is available. Special camshafts are imported or can be reground by specialists. Compression can be raised by installing special pistons or the head can be ground to raise it a couple points—a .050" to .095" cut is the allowable range: then the firing chamber volumes should be equalized by grinding. Use of a 4CV cylinder head, when available, will give an automatic rise in compression ratio for the Dauphine.



The back of the left glove compartment makes a handy mounting space for accessory instruments, as car is not factory equipped with ammeter or tachometer.

But whether you attempt the custom, souping work or prefer to stick to the standard maintenance and repair, your customer will be happy that you do the work for him; and he'll be willing to pay for it.

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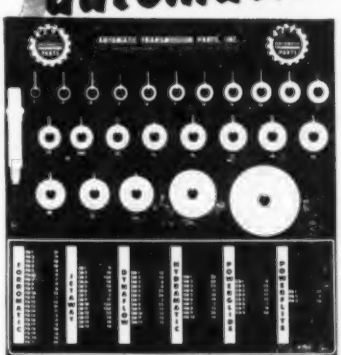
1 BUSHING DRIVER SET services 7 makes of automatic transmissions



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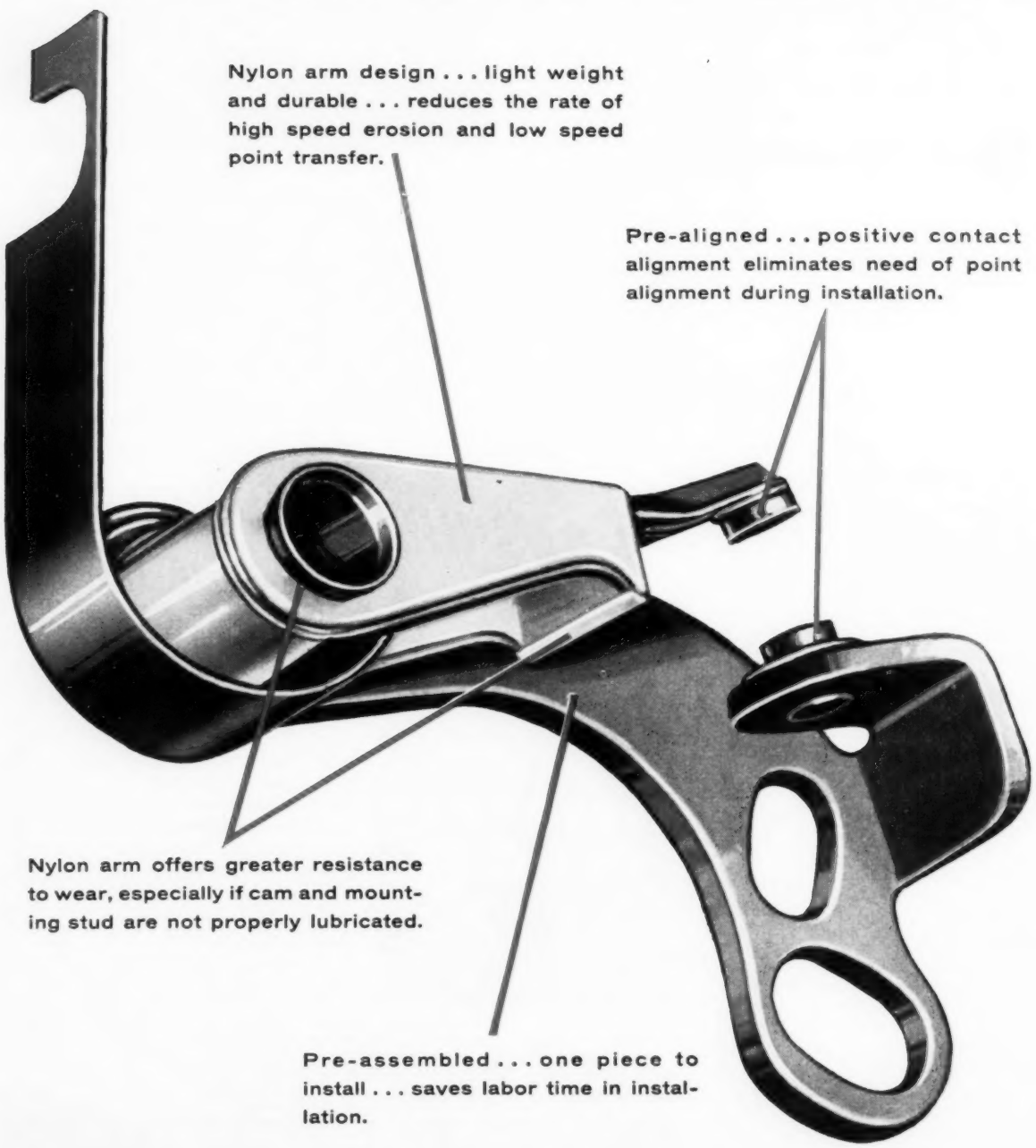
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Progressive increase in engine compression ratios over the past few years, with coolant capacities remaining substantially the same, presents a real challenge to the process of dissipating excess heat and maintaining efficient engine operation over the entire range of rated speeds. You need to know . . .

Engine cooling principles

By BEN M. IKERT, Editor

● STRANGELY ENOUGH, a "heat" engine used in a motor vehicle must have a "cooling system" to keep it running efficiently.

Automobile, truck and tractor engines are called "internal combustion engines," because fuel combustion takes place directly within the cylinders. In "external combustion engines" (steam for example), the fuel—coal, wood, oil, gas, or other—is burned in the fire box: in the case of a steam engine, the steam generated in the boiler is carried by external means (usually pipes) to the cylinder, where it actuates the piston and produces power. The cylinder of a steam engine is cooler than that of an internal combustion engine—wherein the temperature rises, at the instant of ignition, by 4,000°F. and even more!

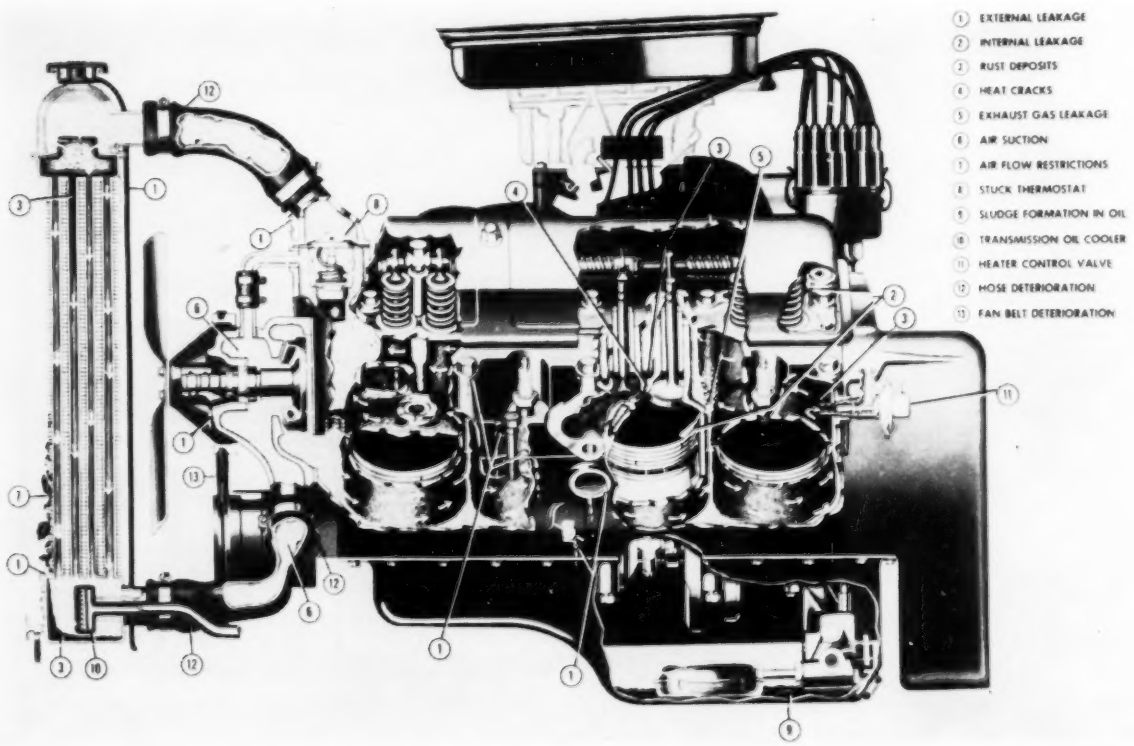
When a gasoline-air mixture is fired in the engine combustion chambers, tremendous heat is developed. This heat expands the gases in the cylinders which makes the engine operate. The greater the compression ratio and the higher the horsepower, the more heat is developed. It must be controlled to insure efficient overall engine operation and prevent damage to the parts.

Controlling the heat is the cooling system's job. And, quite a job it is, what with a continual rise in compression pressures, horsepower and addition of accessories such as air conditioners and so on.

While power and pressure have increased in recent years, cooling capacities have stayed substantially the same. In fact, many modern radiators are somewhat smaller in physical dimensions than those of some 8 or 10 years ago. The accompanying graph of coolant system capacities and horsepower shows what's happened over the years.

Note, for example, that the 1958, 300-hp. engine of car "A" has a cooling capacity of 18 qts., while the 170

Fig. 1—Cutaway view of engine and radiator showing the operation and check points of the cooling system. Illustration does not represent specific make of car but incorporates features used by many different manufacturers. (Illustration courtesy National Carbon Co.)



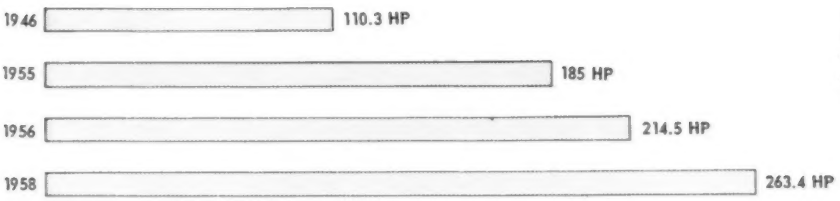


Fig. 2—Engine horsepower has been steadily increasing especially in recent years, as will be noted from the average horsepower for 1955, 1956 and 1958.

hp. engine of 1952 likewise had 18 qt. capacity.

Another case: Car "D" has a 290-hp. engine for 1958, with a cooling capacity of 24 qts.—1 qt. less than for the 1952 engine of 180 hp.

Car "H" for 1958 has a 305-hp. engine with a cooling system capacity of 20 qts., as against the cooling capacity of 21½ qts. for the 1952 car.

ENGINE SPEED UP

Generally speaking, engine speed has increased over the years. Take as an example, 1952-1958, for which the following are typical:

	1958	1952
CAR "A"	4600 rpm	3800 rpm
CAR "B"	4600 rpm	4000 rpm
CAR "I"	4800 rpm	3600 rpm
CAR "H"	4600 rpm	3600 rpm
CAR "J"	4500 rpm	4000 rpm

From the foregoing facts it should be evident to those in the automotive service business that cooling maintenance is a top factor in attainment of efficient engine operation. Another fact emphasizing increasing need of cooling system service for the modern engines, is the constant increase in horsepower averages. The horsepower graph in this article shows, for example, that the average horsepower of domestic passenger car engines went from approximately 110.3 hp in 1946 to 263.4 hp. in 1958.

Since cooling system flow capacities have remained about the same, while power and heat production have sky-rocketed, the coolant has to be circulated faster today to do an amount of excess heat rejection comparable to that in earlier engines.

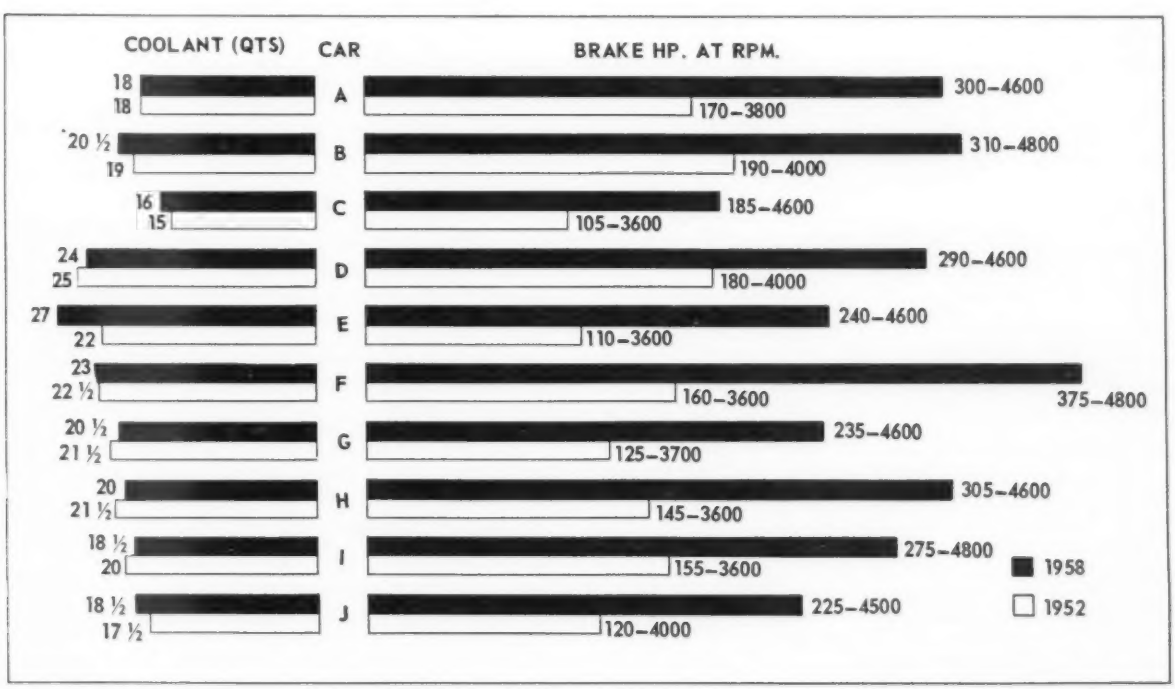
In modern cars, the cooling system has to spread its function to automatic transmissions. For example, H. W. Loper, Research Engineer, The Dow Chemical Co., puts in a reminder that torque converters of automatic transmissions are cooled by water or antifreeze in the cooling system—the same coolant that serves the engine. Therefore, if the transmission is to operate at top performance, the engine cooling system must be properly maintained. A dirty or malfunctioning cooling system can be the cause of an overheated transmission.

This is true since part of the coolant from the radiator is circulated through a smaller "radiator" known as an intercooler. Circulated through this intercooler is the torque converter fluid. The intercooler prevents the torque converter fluid from becoming overheated and losing its efficiency.

An estimated 400,000 cars, or about 6%, were equipped with air conditioners in 1957; and factory-installed units are now available on all American-made cars. Air conditioning units have gained at the rate of 1% of total production every year for the past 3.

The addition of air conditioning to a car makes more

Fig. 3—Relationship between brake horsepower and coolant capacities of 1958 engines compared with 1952 engines. While compression ratios and horsepower have soared, cooling capacities have remained substantially the same over the years.



important than ever, the need for proper servicing of the automobile cooling system . . . for air conditioning places a new burden on the cooling system. Air flow through the radiator is restricted, and the engine compartment is further crowded.

All air conditioners have a compressor — usually mounted on the engine block; a condenser, located in front of the radiator; an evaporator-blower assembly, fitted into the trunk or under the instrument panel; lines connecting these units, and controls on or near the instrument panel.

FREE-AIR SPACE AT A PREMIUM

Free-air space in an increasingly crowded area of the car, is reduced by the addition of the compressor to the engine compartment. Of more effect on the cooling system is the Freon condenser, placed in front of the radiator. This cuts down the amount of air flowing through the radiator; while the condenser also gives off heat which considerably increases the temperature of the air before it reaches the radiator.

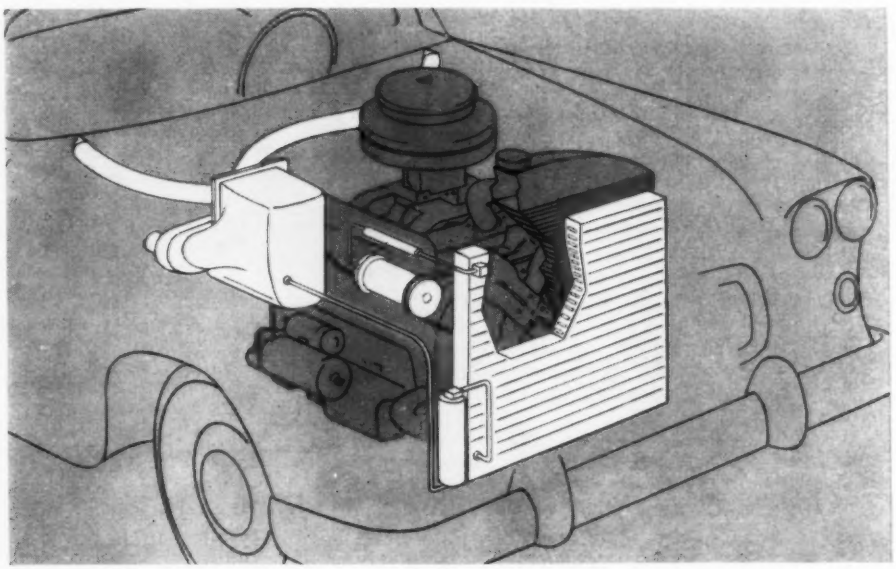


Fig. 4—Component parts of a typical front end car air-conditioner. Left to right; evaporator-blower assembly attached to firewall; compressor, mounted on engine block; condenser, placed in front of the radiator.

To meet these problems, cars equipped with air conditioners installed at the factory also have radiators with greater heat rejecting capacity. In addition, they are equipped with such features as five-or six-bladed fans, instead of the usual four blades; 17-lb. pressure caps, instead of 13 or 14 lbs., and shrouds around the fan.

In controlling engine heat the cooling system keeps the engine as closely as possible to the right temperature for good engine performance over a wide range of speed, power and operating conditions at varying atmospheric temperatures.

QUICK WARM-UP ESSENTIAL

A cooling system in good condition (clean and non-leaking, with all mechanical parts working properly) holds in engine heat during the warm-up period so the engine will get to its correct operating temperature as quickly as possible. This cuts down the chances of unburned fuel getting past the piston rings to dilute the oil. However, when the engine gets warmed up to its efficient operating temperature, the cooling system again goes to work getting rid of excess heat.

Quick warm-up to attain an efficient operating temperature is recognized in the Edsel cooling system, for example, where three thermostats control the warm-up by establishment of three warm-up zones. At the start all three thermostats are closed. Coolant circulation is restricted by the first thermostat to the head, intake manifold and carburetor. When this zone reaches correct temperature the second thermostat opens allowing additional circulation to the block. As the block reaches operating temperature the third thermostat opens to maintain the minimum pre-determined coolant temperature. The thermostat restricts circulation so the amount of heat to be dissipated is limited to that supplied to the cooling system above thermostat temperature.

In a liquid-cooled engine (the coolant may be water or anti-freeze) the cylinder block (or blocks) and heads are cast with intricate passages around the cylinders, around or under the valve seats and within the cylinder heads over the combustion chambers. These passages give the block and head a sort of double wall construction and the passages are normally filled with water or other coolant.

COOLANT FLOW MUST BE CONSTANT

Provision is made for the block and head assembly to have a water inlet and a water outlet, the latter usually being at the top front of the cylinder head.

As the pistons move outward on their power stroke, more and more of the cylinder wall surfaces is exposed to heat. In most engines the water passages extend the full length of the cylinders and give the excess heat of combustion a much better chance to pass through the oil film on the cylinder walls, through the wall itself and into the water or coolant. Excess heat also passes into the coolant inside the cylinder heads.

The water pump keeps pushing the coolant into the cylinder block and if the coolant is hot enough to open the thermostat (usually located within the water outlet elbow on the cylinder head), the coolant goes right through the block, into the head and out of the top hose connecting the head to the top tank of the radiator.

Actually the only tie-up between the engine's crankshaft and the engine's cooling system is a belt—the fan belt. This belt is an important link because it has two important jobs—driving the fan and water pump. In modern cars this function becomes increasingly important

Fig. 5—Proper heat transfer at various water pump circulation rates—important cooling factor—being checked at various temperatures in the laboratory of Dow Chemical Co.

since coolant capacities are about the same as with previous engines, while horsepower and compression ratios are up. According to a reliable source the water pump may have to circulate as much as 7500 gallons an hour. Certainly a good reason why belts and pumps must be up to par at all times.

HEAD GASKETS PLAY KEY ROLE

Head gaskets are a most vital item in engine cooling systems. They must withstand compression and combustion pressures, as well as seal the coolant jacket joints in the block and head. The key role of gaskets becomes evident when it is realized that combustion pressures may be around 700 p.s.i and coolant jacket pressures may get as high as 30-35 p.s.i.,

The radiator has a top and bottom tank with a "core" between the two. The core has many narrow passages through which the water or coolant flows. There are from 4 to 5 thousand square inches of cooling area in the radiator; and the water or coolant flows through core passages no wider than the cross-section of a thin dime, the metal of the small tubes being no thicker than a sheet of paper. These thin walls of the core are cooled by the oncoming air when the car is in motion or by the fan when the car stands still with the engine idling, or with the car travelling at very slow speed. Obviously the water pushed to the top radiator tank by the pump is very hot; but as it passes down through the narrow radiator core passages, much of the heat is removed to the atmosphere by the air moving through the core.

The bottom radiator tank connects by a hose to the suction side of the water pump and since much of the heat has been removed from the coolant, the relatively-cooler liquid is once more pushed by the pump into the cylinder block; and thus the cooling process goes on and on. But not forever. Sooner or later time and neglect (the latter chiefly) take their toll; and service work of either minor or major proportion is necessary.

An overheated engine if allowed to run, even for a few minutes, might cause the pistons, bearings and other parts to seize or even break. Even a partially overheated engine may cause knocking and pinging; and be unable to deliver full power over the speed range. Of the five essential engine processes—lubrication, compression, carburetion, ignition and cooling—cooling overlaps them all, and to a large extent governs their behavior. An overheated engine upsets lubrication, compression, carburetion and ignition; so it's easy to see that part of the cooling system's job is to stabilize these processes . . . and it can only do so if it is serviced properly at regular intervals.

FAILURE CAN PROVE DISASTROUS

Most any engine will operate with an incorrect carburetor mixture, a weak spark or uneven cylinder compression—not smoothly or economical, of course, but it will run. However, the failure of lubrication or cooling can prove disastrous, an extreme case being that of attempting to operate an engine without any oil or coolant. By the same token, engines can be damaged by even *partial* failure of the lubrication or cooling processes.

Heat makes itself felt in the engine even before the air-fuel charges are fired inside the cylinder combustion chambers. It's well known that when one uses a hand tire pump, the pump gets hot because of the compressing or squeezing of the air within the pump. Likewise, considerable heat is produced during compression within the engine cylinders. The higher the compression ratio, the higher the temperature rise. The process of combustion, adding much more heat to that built up during com-

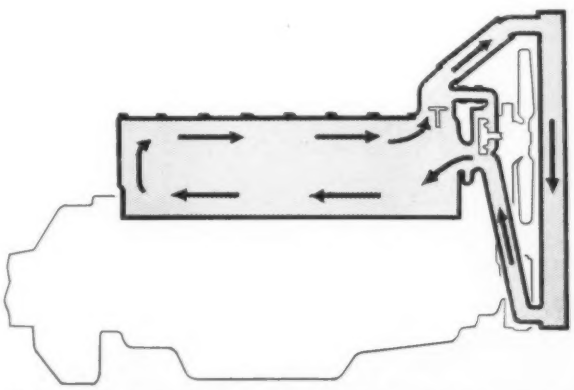


Fig. 6—In a clean and unrestricted cooling system, at operating temperature and thermostat open, the coolant flow through block and radiator follows the course of the arrows.

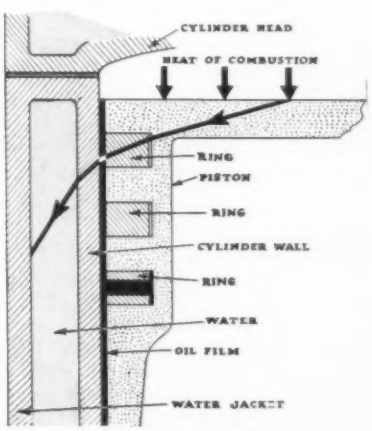


Fig. 7—How excess combustion heat travels through the piston, ring, oil film, cylinder wall and finally to coolant.

pression, takes place so rapidly at high engine speed that, if some means were not provided to dissipate the excess heat, engine parts actually would melt.

Generally speaking about 20% of the gasoline's heat energy is converted into mechanical energy for propelling the car, the other 80% being dissipated or carried away as waste. About one-half of this waste goes out through the exhaust system; and the other half is removed by the cooling system to prevent engine destruction. If the heat can be dissipated as fast as it is generated, there will be no temperature rise and the instrument panel gauge will show a normal reading—not too hot, not too cold.

AFFECTS ALL-AROUND PERFORMANCE

If the heat balance is upset (clogging, broken or leaky gaskets, broken or loose fan belt, malfunction of water pump, loss of coolant, etc.) there is a temperature rise. If the increase in temperature comes to the boiling point of the coolant, trouble usually follows. With pressurized systems the boiling point will he higher than the atmospheric boiling point of 212°F.—may go as high as 230°F.

A big factor in efficient engine operation is the interrelation of the cooling system and lubrication system. Adequate lubrication of cylinder walls, pistons, rings, pins, valves, bearings and other moving parts depends upon the cooling system. Too cold an engine means oil too cold to lubricate properly, and then there is dilution by gasoline. Too hot an engine means the oil's too hot, and there's loss of power, and finally, the mileage obtained from fuel depends to a great extent on the efficiency of the cooling system.

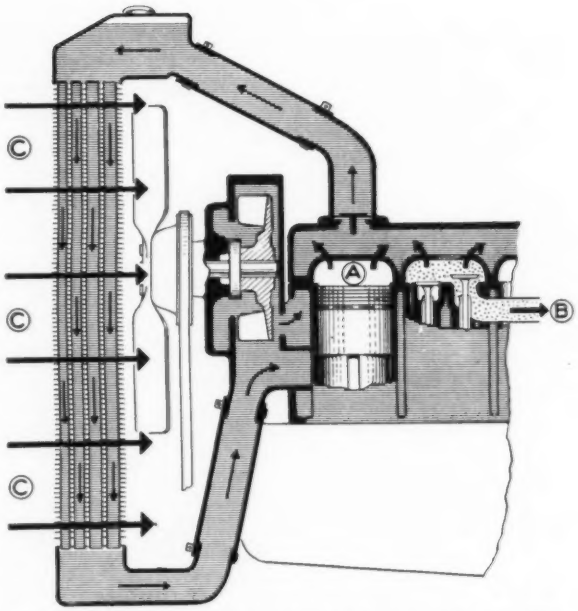


Fig. 8—Compression and combustion heat passes from (A) to the coolant. The pump pushes the coolant through the thermostat, through the radiator core, where the fan and car movement force air (C) through the core. This lowers the coolant temperature. Some exhaust heat enters the coolant, the remainder passing into the exhaust port (B).

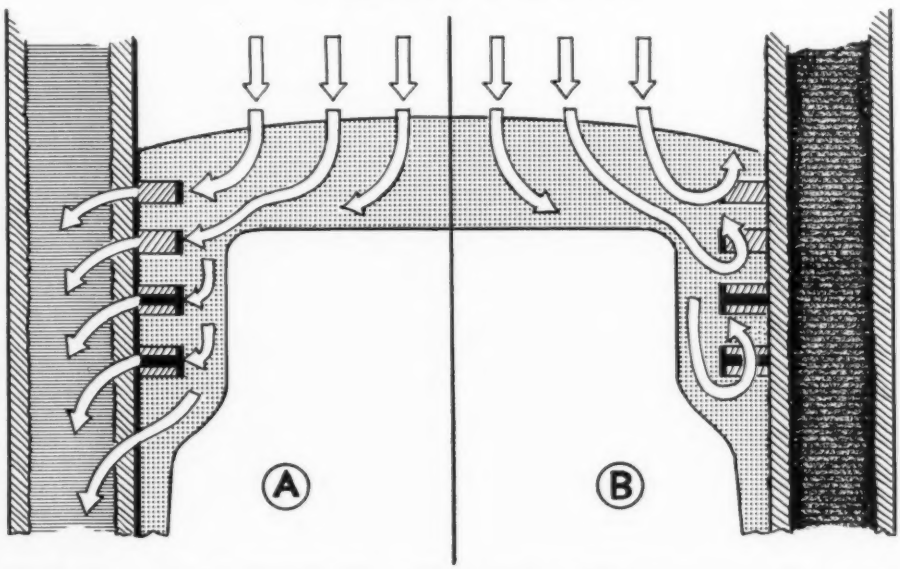


Fig. 9—Combustion chamber heat flow (arrows) through piston, rings, oil film and cylinder wall to coolant in engine water jacket in (A) normal, clean cooling system and (B) dirty or impaired system. Note that arrows (heat) curl back in (B), causing parts to overheat.

Automatic Transmission Parts Added to Thompson Products Line

Thompson Products Service Sales Division has announced the addition of automatic transmission parts and hydraulic valve lifters to its replacement parts service.

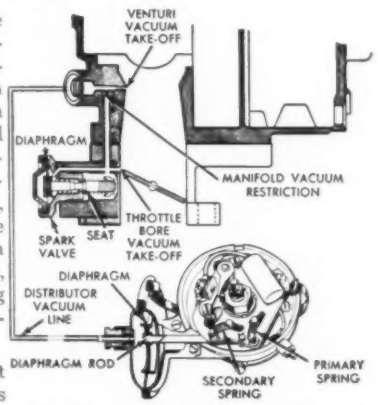
According to a company spokesman, "A thorough research job was done by Thompson before announcing our line of automatic transmission parts. We studied the jobbers' problems, his likes and dislikes, stocking arrangement at the jobber level and trade level and sales and merchandising incentives. As a result of this fieldwork, the company has produced a new, easy-to-use Automatic Transmission Parts Manual and developed a practical packaging program."

The new manual covers every type of automatic transmission since 1940 and is said to be so simplified with pictures, codes and instructions that it makes identification and ordering of parts 100 per cent positive.

To conserve space on the jobbers' shelves, speed counter service and simplify parts ordering by the mechanic, parts packaging has been given great consideration. Gaskets and seals, for example, for almost every transmission repair job are packaged in polyethylene-covered kits. The repairman simply orders the kit needed for the job being performed.

Checking Pressure Type Distributors

According to recent Champion Spark Plug Co. Service Bulletin, "pressure type" or so-called all-vacuum operated distributors are used on some engines to make spark timing primarily sensitive to changes in engine load. These differ from the usual centrifugal type of distributors which make timing sensitive to r.p.m.'s. Like any other component, such distributors require reasonable maintenance to assure best performance.



As shown in the accompanying diagram, distributor action is served by a combination of both venturi vacuum and throttle bore vacuum. A spark control valve is used, however, to improve response to sudden throttle movements, thereby reducing "pinging" tendencies:

Obviously, if dirt or gum accumulates after long service at the port or at the spark valve, advance calibration is likely to be affected. For instance, if the throttle bore port is clogged, spark timing may be partially retarded at part throttle and may not advance sufficiently at wide open throttle. If the venturi port is plugged, however, wide open throttle advance will be retarded while part throttle advance may be somewhat increased. Should the spark valve be stuck, sharp pinging during sudden acceleration may be noticed.

Any apparent change in power output or knocking tendencies should therefore suggest a check of the spark control system:

1. Be sure the throttle body or venturi ports are not obstructed with dirt or gum.
2. Remove and inspect the spark control valve for freedom of operation. If in doubt as to the condition of the diaphragm, replace the entire valve assembly.
3. With the spark valve removed, blow out the carburetor vacuum channels with compressed air.
4. Disconnect the carburetor-distributor vacuum line and clean it with compressed air.
5. Check the distributor vacuum diaphragm for possible leakage.
6. Inspect the distributor for faulty springs or a sticking breaker support plate.

New Automatic Choke Housing Helps Cure Poor Economy, Rough Idling on '58 Fords

According to a recent Ford Service Bulletin, new Carter automatic choke housings (Part No. B84-9848-D) and gaskets (Part No. B8A-9871-B) are now available to correct the few cases of automatic choke malfunction. This difficulty has been found to cause poor economy and/or rough idling.

Correct setting for the new housing is two notches *lean*. Note, however, that with the air cleaner removed, the choke plate will not be fully opened at idle r.p.m.'s. It will be open fully though in normal driving. If you do have to install this new housing, it is suggested that the manifold heat stove and connecting line be checked for vacuum leaks.

$10,000 SAVED BY PANELBLOC INSTALLATION IN AUTO SALES AND SERVICE AGENCY

When Paul McGlone Chevrolet, in suburban Detroit completed their new showroom-service center, they asked for bids on heating.

When the bids were opened, it was discovered that a battery of Panelbloc gas-fired heaters, installed complete, **would cost $10,000 less** than a conventional heating system. Mr. McGlone specified Panelbloc.

After two full season's use, Mr. McGlone is still realizing savings. His fuel bill is less than anticipated. His entire floor area is clear for display or repairs. Mechanics turn out jobs faster, and customers can examine his display in comfort—regardless of outdoor temperatures.

Write for information on this and other money-saving Panelbloc installations in garages and service stations.

Thermobloc Division
PRAT-DANIEL CORPORATION
6-10 Meadow St. So. Norwalk, Conn.
In Canada—Canadian Wanson Combustion Equipment Ltd.
164 Metcalfe, Montreal

Gentlemen: ( ) Please rush literature on Panelbloc
( ) Have representative call
Name_____
Company_____
Address_____
City & State_____

Will expressway expansion dislocate service businesses?

By BEN M. IKERT
and
GEORGE A. WHITTINGTON

Interview*

JOSEPH J. CAVANAGH, President of the Chicago Motor Club, has been with the Club since 1921; and played a major role in the establishment and growth of its 56 Illinois-Indiana branch offices, 101-county network of affiliated service contractors. He is a member of AAA's executive committee, board of directors, highway committee, national touring board. An alumnus of John Marshall Law School and one-time loan department vice president, Fort Dearborn National Bank of Chicago, Cavanagh has long been active in civic affairs. He has served on Chicago's Plan Commission, Home Rule Commission, committee on city-owned parking garages; and is credited with sparking the movement that led to the Chicago Area Transportation Study.

• HERE AND THERE across the nation, roads once jammed with weekend and holiday traffic are now lightly travelled. Motorists who previously moved through in a heavy stream, enroute to popular places or events, whiz across the area today on newly-opened, limited-access expressways.

These are links in the rapidly-growing National System of Interstate and Defense Highways—which is to be the "main street" of the nation to motorists. It will link 90 percent of cities with population of 50,000 or more—as well as many smaller cities and towns; serve more than half our urban, and nearly half the rural population. While this network of some 40,000 miles of integrated roads will make up only a little more than one percent of the total national mileage in streets and roads, it is expected to carry 20 percent of the traffic.

SERVICE OUTLETS BY-PASSED

Under the impetus of accelerated Federal spending, new links in the system are beginning to come into use. As they do, of course, situations like the one described above are bound to occur—drastic reduction of the use of older routes by through traffic. With this, sometimes comes another condition . . . one that has raised a certain amount of alarm in the automotive service field.

For there are gas stations along these routes which depended upon that weekend and holiday traffic for the volume of business that put them "in the black" . . . which sometimes had the pumps manned only during the peak traffic periods. Now of course, such establishments wither on the vine, with the accustomed transient business cut off!

Noting this, it's natural to wonder: What about other automotive businesses in the areas being bypassed via expressways? Will the independent and dealer service shops, which lean more to selling multiple mechanical services, also suffer with the decline of transient traffic? If so, what's to be done about it?

In view of the fact that an estimated three-quarters of the new expressway system will be on new location—with infrequent service roads—the questions, and their answers, are interesting and timely . . . to say the least. At the rate the National System is springing into being, it will soon be in the business "back yard" of service shops everywhere. The time to get the facts and plan appropriate action, is now.

For the facts, ASD's editors turned to the Chicago Motor Club, which for more than 52 years has been a leading factor in the development of both better roads and better automotive service. CMC was instrumental in the campaign that gave Cook County, Illinois, its first bond issue for a system of hard roads, back in 1914. It has consistently spearheaded drives for better highways, greater safety; fair treatment, and improved facilities and services to motorists, down through the

*One of a continuing ASD feature series.

years. Among its recent campaigns, for example, is the drive for completion of the Chicago-Indiana-Detroit Expressway.

The Club's Emergency Road Service Department, backbone of its service to members (more than a quarter-million motoring families), has grown since 1920 until today the official Motor Club "family" includes some 1,400 bonded service outlets in its Illinois-Indiana territory. Through the Chicago Motor Club's affiliation with the American Automobile Association, it is a vital unit in a national organization of more than 6,000,000 motorists and 18,000 service contractors.

Joseph J. Cavanagh, President of the Club and himself a leader in its major activities for many years, gives our readers the benefits of his own experiences . . . and draws as well, on the extensive records and research of the Chicago Motor Club . . . in the following paragraphs:

* * *

Question: It's predicted that we'll have 40,000 miles of express highway, compared to the present 9,000, by 1972. Is the Motor Club planning any changes in its arrangements to provide emergency service to its members, on the basis of the nature or expansion of superhighway travel?

Answer: Our Club, together with all A.A.A. motor clubs, played a prominent part in bringing about the rapidly developing nationwide express highway systems. Consequently, we have been planning for years for whatever changes may be required to provide emergency road service to our members on superhighways. Continuous checks are being made on newly opened highways, toll or free highways, in all parts of the country. We will be guided by these studies in deciding what additions to make to our present facilities. In these surveys we are closely collaborating with highway officials, toll road managements and the experienced operators of service facilities.

Q. What steps have been taken, or will be taken?

A. Thus far the steps that have been taken as the result of our joint efforts with officials of toll roads and state highways and service operators have principally been to establish better means of communication by which our members quickly can be put in touch with club service facilities when they are required. In some areas, the problem has been dealt with by arrangements for highway patrol cars to radio calls for emergency aid for club members to their headquarters, which in turn relay them on to affiliated service stations. It has been our practice to furnish lists of our stations to police officials and highway authorities, so that the stations can be contacted quickly when service is required. It is also expected that the installation of numerous outdoor telephone booths along express roads will be helpful in providing this needed communication.

Q. How has the growth of expressways affected the operation of Motor Club service contractors over the past few years? Has there been need for additional contractors in new locations? Have some service outlets had to be relocated due to shifts in routing?

A. Thus far the development of expressways has not affected the emergency service phases of the operations of many motor club service contractors to a great extent. It must be remembered that the rendition of emergency road service is but one department of the functions of agencies which may be selected as official service stations to render, under contract, service to Motor Club members. Some of these agencies are primarily specialists in

Popular and busy service of the Chicago Motor Club is the Touring Bureau, which provides up-to-the-minute information on road conditions, weather, routes, accommodations and any other conditions important to the members' travel plans. Those who man this main office location, and the desks in each of the individual CMC branches, are specialists in many things, and handle a bewildering variety of requests.

electrical and ignition systems; others concentrate on major motor overhauls; others specialize in body and fender work; and still others are concerned primarily with conducting gasoline filling stations or super service stations providing a wide variety of all automotive services.

New service station appointments have been made; but this has been due less to shifts in routings over expressways than to the other normal factors of shifts in population and growths in various districts, as well as increases in memberships in AAA clubs. As the demand grows in any area the supply will be adjusted to meet it.

Q. Has the expansion of expressways brought any changes in the Motor Club's requirements for appointment as a service outlet contractor? Have you found, for example that more tow truck equipment is required because of more cars and harder driving on expressways; and have you accordingly, required your contractors to have a larger amount of such equipment?

A. Generally, the volume of service work will dictate the quantity of equipment needed. Thus far the expansion of expressways has not resulted in changes in requirements for appointment as a club official service station. The safety features in expressway construction have eliminated many accidents which formerly would have taxed the facilities for towing; eventually the need for as much heavy-duty wrecker equipment may be lessened in the vicinity of superhighways. Some service stations have felt it essential, in their judgment, to acquire additional equipment because of the greater distances between entrances and exits of the particular section of the expressway which they serve. They have recognized in their particular cases, that the time necessary to complete a service call may be greater on some expressways than on a conventional type of road, because of the longer distance involved to make a turn-around movement. For this reason, some have added equipment.

Q. When a superhighway bypasses one of the Motor Club service locations, is there generally a drop-off in business for the operator? Does the new road, with its limited access provisions, divert a large amount of through traffic and thereby cut down the service shop's business volume?

A. The answer to this question depends upon the nature of the principal business of the official club service station. As might be expected, a filling station in an isolated site might suffer a reduction in its sales of gasoline to transients if the transients take a different route than before. Most club service stations, however, are in the other categories, such as body and fender specialists, motor overhaul, garages, etc., and depend primarily upon local trade. Thus their location upon heavily traveled highways is not particularly important to their principal volume of business. In the rendition of emergency road service calls, business location is of little significance.

Q. Do you expect an increase in service calls from members driving the high-speed traffic arteries?

A. No. We believe that the percentage of normal mechanical disablements will be the same as on any other highways; but of course, with increased traffic involving a greater number of cars, there is likely to be a greater number of emergency road service calls based upon such normal mechanical difficulties. At the same time, it is likely that the number of accidents will be reduced because the emphasis in superhighway engineering and design has been on safety features. Our continuing studies will indicate what may be expected as to increases in service calls when the expressway system becomes more extensive.

Q. According to the Bureau of Public Roads, Department of Commerce, three-quarters of the forthcoming National System of Interstate and Defense Highways will be on new location. Do you believe that such shifting of routes will seriously hurt the business of the present service shops? Will service shops which depend upon a sizable volume of maintenance and repair work, have to re-locate or lose a big percentage of their transient business?

A. As indicated in reply to an earlier question, the shifting of routes should have little effect as to reducing the total business volume of club emergency road service stations whose principal business activities are more than the sale of gasoline and oil. The backbone of the business of most service stations lies in repairs and maintenance services rendered primarily to residents of the locality. Very few of these stations derive a substantial part of their total incomes from transients, who may be expected to pass them by on expressways.

Q. In a talk last year, a research representative of the Bureau of Public Roads expressed the opinion that the highway expansion will bring with it an expansion in gasoline and service stations everywhere . . . and that these new outlets will rely to a large extent, as in the past, on regular or local customers. Do you agree with this viewpoint?

A. We agree that the vast program of building will require additional facilities: more gasoline will be sold, more repairs made, more parts sold. The great new road construction program is sixty times as great as the building of the Panama Canal. Of course, all business will profit. More cars will be built, sold and used everywhere, improving business

in all sections and not merely along the expressways.

Q. Studies of toll road driving, made by the Bureau of Public Roads, indicate that most trips are short, and that the motorists buy only one-third of the gasoline they use on the toll road at toll road stations. Presumably, most of the service dollar would also be spent elsewhere.

Do you believe that the motorists' spending will follow the same pattern when expressways are more general? That is, will the average trip still be so short that no gas buying is required . . . and will car owners tend to give their business to their local service shop and gasoline stations?

A. It seems likely that the pattern developed upon the fraction of superhighways now in existence will apply to the total system when completed. The majority of trips will be, as they are now, relatively short; and gasoline purchases at facilities on the expressways held to a minimum. We believe that the "service dollar" will be spent principally off the expressways in the home localities of the motorists as is the case today.

Q. Other Bureau of Public Roads research has led to this conclusion: "Presumably the ideal location for any service facility would be . . . clearly visible and easily accessible from the expressway, yet close to or in a community that will provide a solid basis of regular customers."

Would you agree with this conclusion? Might such a location become a requirement for Motor Club contractors in the vicinity of an expressway, or has the Club any other plan for advising transient motorists of its service outlets?

A. For Motor Club members it is not so essential that contract emergency road service facilities be clearly visible from expressways. All Motor Club members are furnished directories of service stations throughout the nation. Our members can readily locate the stations even though they may not be visible from an expressway. These service station directories list the towns, service stations and repair garages, and their day and night telephone numbers to aid our members in acquiring service when needed. While a prominent location, such as that described by the Bureau of Public Roads, might be an asset in acquiring other business, it is not vital to a club emergency road service station.

Q. In your opinion, what steps can be taken by the independent and dealer shops to recoup business volume in repair and maintenance work, which is lost as a result of rerouting traffic onto nearby expressways?

A. First of all, we do not think there will be any reduction in the total of business. On the other hand, we believe that much business will be gained. As we have indicated earlier, filling stations which in the past have depended principally upon transient business may be affected adversely for a time. They would seem to have no alternatives other than changing locations, or diversifying their operations, to put greater emphasis upon services, other than gasoline and oil sales, which they can hope to render to residents of their own localities as a strong business foundation. Most service contractors now serve their neighboring motorists primarily; would lose little business because of expressways, and soon would gain greatly by the increase in numbers of automobiles and in the popularity of motor travel.

* * *

More business volume—not less—through expansion of the expressway system. That's the outlook for the properly-managed automotive service shop. Those who've run a shop on the premise that profitable service business is built only on a broad range of mechanical work, done to customer satisfaction, can see themselves proved right in the facts made available through the Chicago Motor Club and its President. More expressways simply means a public more motorized than ever before; and car owners spending service dollars, as always, at the neighborhood shop that has and uses sound technical and business know-how.

The Pennsylvania Turnpike—key link in our growing expressway system. Official Commission photo: Wilkes-Barre Interchange.

NEW CAR ANNOUNCEMENTS

Cadillac

Cadillac's completely new rear end treatment for 1959 includes the jeweled tailpanel and wrap-around rear window. The slight overhang of the roof above the rear window serves to help keep snow and rain off the glass. Also note the clean, uncluttered side and treatment of the front grille assembly.

● COMPLETE RE-STYLING across the board is Cadillac's treatment of all 1959 models. Mr. James M. Roche, General Manager of the Cadillac Division, introduced this year's car to the press in Detroit with the flat statement, "Cadillac's most completely new line in 57 years."

Outstanding mechanical features include V-8 engines that emphasize extremely smooth operation, and radically new shock absorbers that use Freon gas instead of air in the space not occupied by fluid. The gas is permanently trapped in a plastic bag. At no time is it free to mix with the fluid to form foam. It's this foaming action (cocktail shaker effect) that greatly reduces the effectiveness of normal shock absorbers.

Compression ratios on all engines have been increased to 10.5 to 1 from last year's 10.25 to 1. Engine horsepower goes from 325 on standard engines to 345 on the Eldorado models. Exhaust valves have been streamlined to permit more effective breathing.

Axle ratio has been lowered to 2.94 to 1. An optional axle ratio of 3.21 to 1 is available. Increased torque at low speeds allows the reduction or rear axle ratio. Torque on standard engine is 430 ft. lbs. at 3100 r.p.m. "Q" engine torque is 435 at 3400 r.p.m.

The 1959 models have the largest glass area ever installed on a Cadillac. There are over 450 square inches of additional glass area in the Sixty-Two sedan compared to the same 1958 model.

A new power steering system is used which features a rotary valve for improved steering wheel response. Also the power steering pump is newly designed to deliver increased capacity.

Electric door locks are standard equipment on the Eldorados and the Sixty Special; they are optional on all other series. A master switch on either front door permits the locking of all doors in a single operation.

Cadillac for 1959 is available in three standard series: The Sixty, the Sixty-Two, and the Fleetwood. An Eldorado Brougham will not be announced with the regular line of cars. It will be presented in the "very near future."

Chevrolet

● A BEAUTIFULLY STYLED vehicle that starts with a distinctively different grille treatment and finishes with a rakishly modern tail panel assembly heralds Chevrolet's entry for 1959.

The grille treatment features horizontal air intakes which are coupled with parking and turn lamps inside. Under the parking lights, at the extreme ends of the grille, are located twin headlamps. The headlamp location is seven inches lower this year than last. The bumper is higher and incorporates extension of rounded sheet metal. The extensions, actually located below the bumper, provide a sleek, over-all tailored look to the entire front end assembly.

Acrylic lacquers are standard equipment on all models, and are carried in 13 solid and 10 two-tone combinations. All cars are marked by color-keyed interiors in upholstery and belt-high sidewall treatment.

Greatly increased glass area is an outstanding feature of the 1959 Chevrolet. Glass now extends higher into the roof panel and curves farther inward at the corners of the

body super-structure. On the four-door sedan, the windshield has a total glass area of 1189.5 sq. in.; an increase of over 600 sq. in. from 1958. This is typical of the added visibility in all new Chevrolets.

Mechanically, nine engines are offered, each can be adapted to multiple carburetor combinations or Ramjet Fuel Injection. Cubic inch displacement ranges from 235 in the six cylinder engines to 348 in the V-8s.

For improved economy—up to 10 per cent more mileage—the camshaft of the 235 cu. in. Six has been redesigned to reduce lift. The low lift cam is designed to be used in conjunction with a specially metered carburetor.

The V-8 engines, with horsepowers from 185 to 315, include greater cooling spaces around the spark plugs in the 348 cu. in. job. Coolant passages are now cast in the cylinder head through enlargement of the outer deck.

Special hood ornaments indicate the engine used with the vehicle. Six-cylinder cars bear Chevrolet script only. A standard V-8 carries the script plus a V. The big V-8 is indicated by crossed flags in addition to the V and the script.

The rear suspension has been reworked to minimize road shocks and instability that tend to be transmitted by the suspension links. To improve riding comfort, the integrated upper control arms as used in the 1958 suspension, have been replaced by two specialized members. One is a curved over-riding member, pivot-anchored at the ends to the frame and banjo housing of the axle. The other is a lateral control bar which connects the right side of the axle housing to the left side of the frame.

When the '59 Chevy hits a bump, the new rear suspension geometry allows the unsprung mass to oscillate with a minimum of lateral reaction to the frame.

Air suspension pistons have been altered and the forward bellows have been reworked to reduce spring rate 40 per cent at the front and 15 per cent at the rear.

Brake lining area has been increased 27 per cent from 157 to 199.5 sq. in. Front shoes are wider by ¾" and rear shoes by ¼". Larger braking surfaces have been provided in the brake drums along with a special cooling design. Projections from the drums extend inward to increase air turbulence around the drum. Openings around the short-spoked wheels also provide increased air circulation and more rapid heat dissipation.

Turboglide has been strengthened structurally. Multiple discs replace cone clutches. Six active faces are applied to the reverse clutch and eight to the forward. Turboglide will be the standard automatic transmission.

A second universal joint has been added to the steering column. It's a yoke and trunnion type, with a molded assembly of fabric laminations impregnated with rubber. It requires no lubrication.

Going or coming, the 1959 Chevrolet creates an impressive picture of sculptured beauty. Lowered headlamps, freshly designed grille, and functional slotted air scoops highlight the front end. Gracefully flared quarter panels and deck lid add to the distinctive styling.

DeSoto

• DESOTO WILL PRODUCE four distinct body styles in 1959: The Fireflite, the Firedome, the Firesweep, and the limited production Adventurer. This latter model will be announced later in the model year, perhaps in the early winter months.

The top engine will be used in the Adventurer. It has a torque of 425 at 3600 r.p.m., and delivers 350 hp. at 5000 r.p.m. It uses two four-barrel carburetors, a special camshaft, distributor, air cleaners, valve springs and dampers.

Other DeSoto engines are the Firesweep with 290 horsepower, the Firedome with 305 horsepower, and the Fireflite with 325 horsepower. The Adventurer, Fireflite and Firedome have a bore of 4.25″ and a stroke of 3.38″. Displacement is 383 cu.in., compression ratio 10.1 to 1.

The Firesweep's bore is 4.12″ and stroke is 3.38″. Its displacement is 361 cu.in., and it, too, uses a compression ratio of 10.0 to 1.

Somewhat in opposition to the rest of the automotive industry, which seems to be leaning toward reducing the number of exterior colors available, DeSoto is offering 190 two-tone combinations and twenty-six solid colors. Interior treatment includes the use of a three-dimensional fabric which will be available in some models.

Chrysler Corporation's new oval steering wheel will be standard on all 1959 DeSotos. Also the swivel seats, self-leveling rear air springs, automatic rear view mirror, and automatic headlight dimmer. An anti-theft deck lid lock is also used on the new cars.

New exterior styling gives the DeSoto a lower and wider appearance. A massive integrated two-section front bumper with a long horizontal air scoop divides lower and upper section.

The styling treatment also includes an integrated rear bumper. Three-tiered taillights have been retained for the fourth consecutive year.

New red warning lights have been built into the instrument panel to replace the instrument dials. The panel is safety cushioned as standard equipment on the Adventurer, Fireflite, and Firedome.

Dodge

• DODGE FOR 1959 incorporates many features which should add greatly to increased driver comfort and convenience. Perhaps the most outstanding of these are the new swing-out, swivel front seats.

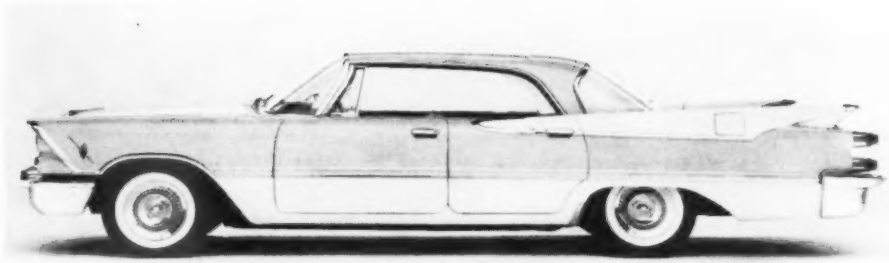
The swivel seats swing out a full 40° on nylon rollers. They return to place and automatically lock into the forward position. The two swivel seats are separated by a stationary center section with a folding arm rest. In the normal position, a regular three-passenger seat is created.

Back rests for both seats can be pushed forward simultaneously, permitting rear-seat passengers to exit from both doors at the same time.

Four new engines are offered by Dodge this year: A 230 cu. in. L-head Six; 326, 361, and 383 cu. in. V-8s. The big engines will be available with either one or two four-barrel carburetors.

Improved Torsion-Aire suspension now includes an optional rear-end "Level Flite" suspension. The twisting torsion bars have been shortened and thickened for bet-

On the Dodge, as on other cars of the Chrysler Corporation line, front seats swivel outward to a maximum of 40 degrees to permit easy exit for front or rear passengers.



1959 Dodge Hard-top models have new roofs for increased rear seating comfort and increased rearward visibility.

ter "spring" action. New cams permit easier and more accurate front end adjustments. The "Level Flite" consists of air bags at the rear corners of the vehicle which permit design height regardless of vehicle load.

The heating and air conditioning units are push button controlled. Air conditioning outlets mounted on the dash panel swivel for improved control of cool air.

An electronic rear view mirror is available on all models. The mirror automatically dips slightly when it is struck by the glare of headlights from a vehicle approaching from the rear. The mirror actuating mechanism is entirely self-contained in the mirror assembly.

A specially designed scanner mounted on the dash panel is the "sensing" device for electronically controlled headlight dimming. The scanner housing is designed in keeping with the sleek appearance of the instrument panel, and is much less conspicuous than the other popular sensing units.

A bar-type safety speedometer which moves from left to right changes colors as speed increases. At speeds under 30 m.p.h. the color is green, between 30 to 50 m.p.h., it is yellow, and above 50 m.p.h. it is red.

The lubricant of Dodge automatic transmissions—Powerflite and Torqueflite— is water-cooled for more consistent performance. The torque converter is in a sealed housing for longer life.

Ford

• FORD FOR 1959 has been deliberately designed to reflect the super-successful look of the Thunderbird. By crisp, taut lines the Ford gives the impression of a much bigger, heavier car without actual increase of bulk. Ford Motor Company apparently feels that consumers will demand more dignity in automotive styling rather than gaudiness or extremism.

In keeping with simplicity of design, the 1959 Fordomatic will have 105 fewer parts than the previous automatic transmission. Fewer parts, plus extensive use of aluminum for the transmission case and bell housing, have reduced the weight of the transmission assembly by 22.8%. This is an actual weight reduction of 50 lbs.

More durable parts, such as an extended life muffler and Diamond Lustre finish (exterior paint that requires no waxing for the life of the car) also will add greatly to the car's dependability and appeal.

Through the use of a full-flow oil filter, standard equipment on all 1959 engines, FoMoCo now recommends an oil change only every 4,000 miles. Increased operating economy, improved engine performance in the 30 to 70 m.p.h. range, and regular gasoline for standard engines are obviously welcome benefits brought about in part by a slight decrease in engine horsepower.

This year's Ford line includes 17 models ranging from the Custom 300's through six station wagon models to the Fairlane's and Fairlane 500's. All models will be on a 118″ wheelbase and will have an overall length of 208″.

For improved riding ability, a new link-type, rubber-bushed ride stabilizer is used to reduce road shock, and re-calibrated shock absorbers have been developed for a smoother, easier ride.

Continuing its concept of "packaging passengers against injury" the entire Ford line will include five cross-member frames with wide-flared side rails, safety door locks, and Lifeguard steering wheels. Safety belts, padded instrument panels, and padded sun visors are available as optional equipment.

Oldsmobile

• TWO BOOMS, starting at the rocket emblem on each front fender and flaring backward to terminate at simple, functional taillight assemblies, accentuate Oldsmobile's "Linear Look" for 1959.

Complete new styling exists across the board for Olds. The Dynamic "88," Super "88," and the "98" have all been extensively redesigned to provide family-sized transportation luxury with a sports car flavor.

Recessed aluminum grilles are featured on all series. On the "98" the grille is extruded aluminum. The grilles on the Dynamic "88" and the Super "88" are stamped aluminum.

A new split choke mechanism is standard equipment on the '59 Rocket engines. By allowing the choke plate to completely open in about 1/3 the time usually required, and still permitting the engine to fast idle until thoroughly warmed up, the split choke is said to contribute to greater gas mileage.

Larger brake cylinders are used on all models and on all four wheels. Increased wheel cylinder piston diameter results in greater hydraulic force against the brake shoes with less driver effort.

The cylinder assembly includes new pistons, connecting rods, connecting rod bearings, crankshaft and camshaft which have been engineered into the engine with an eye to establishing the quietest operating engine in Oldsmobile's history.

The compression ratio on the two new Rocket engines is 9.75 to 1. The "88" engine has a fuel-saving Econ-o-way carburetor. The Super "88" and the "98" engines use an improved Quadri-Jet four-barrel carburetor. The four-barrel is optional equipment on the Dynamic "88."

Engine breathing efficiency of both new engines has been improved through design advances in the manifolding—both intake and exhaust. In the intake manifold, the incoming fuel-air mixture travels a shorter, more even, direct flow to the cylinders. The ports in the exhaust manifold are larger for more rapid exit of exhaust gases. The intake valves have been increased in diameter to add further to the engine's deep breathing characteristics.

New "Air Scope" brake drums on all four wheels are standard equipment. These drums have a flange extension which extends inward — toward the center of the vehicle — to catch and direct a greater amount of air toward the heat generating drum surface.

New rotary valve power steering that requires as little as one pound of driver effort to turn the wheels in normal driving, and never more than 2½ lbs. under the most difficult parking situations is available on Oldsmobile. This unit also features a self-adjusting device which maintains precision performance without periodic adjustment.

New mechanical features, complete body re-styling, and elaborate use of glass are the outstanding highlights of the 1959 Oldsmobile.

ENGINE SPECIFICATIONS

	Dynamic "88"	*Super "88"*	*"98"*
Bore	4.000	4-1/8	4-1/8
Stroke	3-11/16	3-11/16	3-11/16
Compression Ratio	9.75:1	9.75:1	9.75:1
Displacement	371 cu.in.	394 cu.in.	394 cu.in.
Max. H'Power	270/4600 r.p.m.	315/4600 r.p.m.	315/4600 r.p.m.
Max. Torque	390/2400 r.p.m.	435/2800 r.p.m.	435/2800 r.p.m.
Carburetion	Dual	Quadri-Jet	Quadri-Jet
Oil Capacity	4 qts.	4 qts.	4 qts.

Oldsmobile's Super "88" Holiday Sportsedan is attractive from every angle. Thin roofline and wrap-around rear window accentuate the "Linear Look" for '59.

Plymouth

• PLYMOUTH'S FRONT END VIEW for 1959 incorporates a completely new grille and "double-barreled" front fenders. The dual headlamps are positioned horizontally above the front bumper and just below the fender overhang.

The front parking lights are curved to provide visibility for the parked car from either front or the side.

The characteristic Plymouth fins have been outward-canted and are chrome capped. The fins start further forward than on last year's Plymouth.

The rear deck lid has been re-designed for all models. A new "Sport Deck" featuring a wheel cover is standard equipment on the Sport Fury models, and is available as optional equipment on all other models, except the station wagon line.

Another optional item is the protective rubber bumper guards which guard the face bar from dents and scratches.

Plymouth, being part of Chrysler Corp., has shared in the results of the Corporation's research and development. Consequently, Plymouth offers in '59 the swivel front seat (standard equipment on Sport Fury models), Mirror-Matic rear view mirror that dims automatically when struck by the glare of headlights from a following car, and automatic headlight dimmer with built-in sensitivity control so that the driver may dial desired sensitivity to surrounding light conditions.

Interior treatment includes a new instrument panel which incorporates three sets of push buttons: One for selecting drive ratio for the automatic transmission; one for radio controls; and a new set for the heating and ventilating system. The interior trim has been completely re-styled with new fabrics in colors keyed to harmonize with exterior colors.

Four engines are available. The Powerflow Six (In-Line) is available on the Savoy and Belvedere models. The Fury V-800 (V-8) is standard equipment on all Plymouth V-8s, on which the standard carburetor is a single two-barrel. The Golden Commando 395 (V-8) is optional on all models and is equipped with a single four-barrel carburetor. The Fury V-800 (V-8) with SuperPak is equipped with a four-barrel carburetor, special camshaft and dual exhaust. This engine is standard on the Sport Fury, optional on all other models.

Also available on the 1959 Plymouth are new self-leveling rear air springs which maintain vehicle design height regardless of load distribution.

1959 PLYMOUTH ENGINE SPECIFICATIONS

	PowerFlow 6	*Fury V-800*	*Fury V-800 w/ SuperPak*	*Golden C'mndo 395*
No. of Cylinders and Type	**6, In-Line**	**8, 90°V**	**8, 90°V**	**8, 90°V**
Bore	**3.25**	**3.91**	**3.91**	**4.12**
Stroke	**4.63**	**3.31**	**3.31**	**3.38**
Displacement	**230**	**318**	**318**	**361**
Valve Arrangement	**L-Head**	**OHV, Lateral**	**OHV, Lateral**	**OHV, Lateral**
Compression Ratio	**8.0**	**9.0**	**9.0**	**10.1**
Carburetors	**Single**	**Dual**	**4-bbl.**	**4-bbl.**
Fuel Recommended	**Regular**	**Regular**	**Premium**	**Premium**

Standard equipment on Plymouth's Sport Fury models is this "Sport Deck". It can be had on all other models as optional equipment.

Pontiac

● CHIEF AMONG THE 65 new features on Pontiac's 14 models for 1959 are lower, wider, heavier bodies of completely new design; a chassis with wider tread; an engine of 5.13 per cent greater displacement for higher performance; a heavier and more rigid frame; new true-contour brakes; plus many freshly engineered accessories.

Displacement of the new Tempest 420 V-8 engine has been increased from 370 to 389 cu. in. and is offered in a broad selection of regular fuel (low compression) or premium fuel (high compression) engines featuring two-barrel and four-barrel and optional triple two-barrel carburetion.

Providing more torque and greater horsepower the new engines are available in four basic options with compression ratios up to 10.0:1. In addition, three special engine options are offered; one a four-barrel carburetor engine for Star Chief and Catalina models, a police pursuit engine and a three two-barrel carburetor engine, the latter two having a 10.5:1 compression ratio.

A new 420-E V-8 engine is added for greater gas mileage. It has a specially designed carburetor, intake manifold and camshaft, and includes a low 2.87:1 ratio axle for reduction in engine revolutions and less wear on pistons and associated parts.

Crankshaft main bearing journals have been increased to 3″ diameter and bearing material is steel backed Durex with a babbit overlay. Engine mounts employ the center of percussion principle, which, theoretically, relates to a point of impact where there is no reaction force at the point of support. By absorbing torque reaction and firing impulses, isolation of engine vibration is improved, while at the same time the new mounts are better able to withstand front and rear impacts.

The basic engines include two regular fuel engines (8.6 to 1) with two and four-barrel carburetors for use with Synchromesh transmission, and 10 to 1 compression ratio engines with two and four-barrel carburetors for Hydra-Matic equipped cars.

Wheel tread has been increased nearly 5″. In addition to creating a low, wide silhouette, the wider tread improves stability, riding comfort and resistance to cross winds. Less steering effort is required on sharp turns because of the lower center of gravity and the wider tread, which decreases the shift of weight from inside to outside. True-contour brakes have been moved inboard and away from the wheel itself for more effective cooling and safer braking.

Brakes have a 9.4 per cent increase in lining area, 39 per cent greater drum weight and a cooling flange on front drums.

The tubular center X-frame has been redesigned for far greater strength and rigidity, with provisions to accommodate the new center of percussion engine mounts. Further ride improvements result from suspending the

Pontiac's Catalina sport coupe. Full width wrap-around rear bumpers, an expansive rear deck lid, oval shaped tail lamp ports, and elongated ornamentation, accentuate the low, wide rear silhouettes of the 1959 models.

lower control arm in rubber; angulating the front control arms with respect to each other to give greater anti-dive effect; larger front coil springs have lower spring rates and modified shock absorber valving provide a softer ride while maintaining controlability.

Bodies for 1959 are up to 9″ longer, 3.3″ wider and as much as 3″ lower. Overall height of the new cars range from 54″ for the sport coupe in Catalina and Bonneville series, to 56.4″ for all sedans and station wagons. Overall length of Star Chief and Bonneville sedans and coupes is 220.7″, while all other models are approximately 214″ in length.

Glass area has been greatly increased. Large Vista-Panoramic windshields that curve back into a thin roof, large side windows with thin pillars and a large wrap-around rear window, gives up to 37 per cent greater visibility. Windshields alone have been enlarged up to 60 per cent. Magic-Mirror acrylic lacquer which is said to get harder and brighter with age, will be used on all 1959 models.

The luggage compartment has been increased in length and width to give an additional 4.4 to 6.8 cu. in. of space. The fuel filler door this year is located in the panel below the deck lid opening on all models except station wagons.

A newly designed, better performing, more compact, power brake unit with a two to one linkage ratio gives a lighter feel and more positive control. With the new type of installation direct interchangeability of power and manual brake units is made possible.

Improvements in Super Hydra-Matic transmission include new rear clutch plate material providing smoother shifts and a new reverse clutch has internal as well as external contact surface on the cone to increase its capacity.

Major engineering changes and completely new design in the 1959 rotary valve power steering gear decreases steering effort and at the same time have reduced its overall size, weight and number of parts. The steering shaft, hydraulic valve, worm, and the rack-piston nut are all in line, making a compact and space saving gear. The formerly used spool type valves have been replaced by a rotary type valve to provide improved response.

With Pontiac's new heater system, heated air is forced through a duct located over the power train tunnel, where it is dispersed on each side of the rear seat compartment.

A new-comer to the Rambler American line for '59 is the 100" wheelbase, five-passenger, two-door station wagon. Like the other American models, it is powered by a 90 hp. L-head Six.

Rambler's Ambassador V-8 Custom four-door hardtop. Adjustable reclining seats provide driver and front-seat passenger with individual fore-and-aft seat adjustments.

Rambler

● THE ENTIRE RAMBLER line for 1959 features new exterior and interior styling, along with several mechanical improvements to further increase Rambler economy of operation and durability.

One new model has been added to this year's 100″ Rambler American line—a two-door, five passenger station wagon with an overall height of 57.80″ and a cargo compartment capacity of 52 cu.ft.

RAMBLER SIX AND REBEL V-8

Eleven 4-door models, including station wagons, hardtops and sedans, are offered in this series. Highlighting the side styling treatment is a missile-like spear which runs the full length of the car; the upper portion of the gently flared tail fins flowing smoothly into the center of the car.

A new die-cast, two-piece grille is said to minimize repair costs, and front and rear bumpers, which feature recessed areas for license plates, are 23 per cent heavier than last year to provide greater strength and durability. Overall exterior and interior dimensions remain unchanged.

The 127 hp. Economy Six is equipped with a new Visi-Flo carburetor designed to increase fuel economy by 1½ m.p.g. of regular grade gasoline. The carburetor's glass bowl allows quick checking of float operation and of any sediment deposits. A dual-throat carburetor with oil-bath air cleaner which boosts horsepower of the Six to 138 is available as optional equipment.

The 215 hp. Rebel V-8 has a 4-barrel carburetor and the valve system has been redesigned to give longer life and quieter operation. To provide further fuel economy, formerly optional axle ratios are now standard equipment on the '59 models at no extra cost.

AMBASSADOR V-8

The Ambassador V-8 line for '59 includes six, four-door models. A new grille features a simple, single chrome bar which extends across the full width of the grille opening, accentuated by chrome strips above and below. Combined parking lights and directional signals are integrated into the ends of the grille bars.

Tail lights are made of new high-visibility red color plastic lenses, and for added visibility and safety, red "Scotch-Lite" reflective material has been integrated into the vertical rear fender fin moulding.

The Ambassador is powered by a 270 hp. overhead valve V-8 engine with a compression ratio of 9.7:1. It is equipped with a 4-barrel Holley carburetor which incorporates new refinements for better fuel control.

RAMBLER AMERICAN

Except for the addition of the station wagon model, the Rambler American remains virtually unchanged.

Both the 2-door Sedan and Station Wagon models are

(Continued on following page)

The Rambler Six and Rebel V-8 models feature new exterior and interior styling for 1959, and engineering changes to further increase economy of operation and durability.

powered by the economy-proven 6-cylinder, 90 hp. L-head engine with a compression ratio of 8.0:1 and displacement of 195.6 cu.in.

The entire line of cars feature exhaust systems in which mufflers and tailpipes have been aluminized and zinc coated to minimize rust problems, and braking systems have been substantially improved by increasing both shoe width and lining thickness. Self-adjustable brakes are optional on the entire line, and a red parking brake warning light is a new option available on all but the American line.

The push-button automatic transmission control system has been changed to eliminate the key-start. The starter button now is combined with the neutral button for simpler operation. A vacuum lock-out prevents starter engagement when the engine is operating.

Studebaker

• MANY OF THE improvements in the 1959 Studebaker Lark result largely from the new concept of the car—substantially reduced exterior size, especially over-all length, while maintaining "big car" interior roominess. The 1959 Studebaker Lark is nearly 3 feet shorter than the average American car, increasing over-all maneuverability.

For improved handling, a new, more efficient steering gear is used on six-cylinder models. This new variable-ratio gear provides faster steering response, requires fewer turns from extreme left to right. Effort required to turn the wheel also has been reduced.

TWO NEW ENGINES

Two new engines will power the new Lark series and the Silver Hawk models—a new 169.6 cu. in., L-head Six, and an improved, short-stroke, 259.2 cu. in. V-8. The Six develops 90 h.p. at 4,000 r.p.m. with a torque rating of 145 at 2,000 r.p.m. The V-8, with standard two-barrel carburetion, develops 180 hp. at 4,500 r.p.m. with a torque rating of 260 at 2,800 r.p.m. Both engines are designed to operate efficiently on "regular" gasoline.

The V-8 with optional four-barrel carburetor and dual exhausts develops 165 hp. at 4,500 r.p.m. with a torque rating of 265 at 3,000 r.p.m.

The new Six has an improved combustion chamber design with a shorter stroke, plus a higher 8.3:1 compression ratio and new carburetion. More efficient two-barrel carburetion and a higher 8.8:1 compression ratio increases the over-all performance and economy of the V-8 power plant. Dual exhausts and four-barrel carburetors are available as options on V-8 models.

A stiffer crankshaft to shorten the piston stroke is used. This accomplishes two things—the pistons have less distance to slide for every mile of car travel and engine displacement is reduced.

The company's comparative tests between the new 1959 Six and the 1958 engine showed nearly a 20 per cent improvement in performance with the new engine at 35 m.p.h. plus an 8 per cent improvement in fuel economy, in conventional third gear between 30 and 35 m.p.h.

With overdrive the new Six shows a better than 8 per cent fuel economy improvement in the 30 to 60 m.p.h. range, where most out-of-town driving is done.

RIDE IMPROVED

Variable-rate front coil springs automatically compensate for variations in load and road conditions to provide level, controlled ride, free of "pitch." New shock absorber valving and redesigned rear leaf springs are said to give a softer ride. A redesigned ladder-type frame provides greater torsional and beam strength. To substantially reduce replacement costs in the event of collision damage, the 1959 models feature removable fender panels.

New reclining front seats are available optionally. Each divided front seat can be adjusted to seven different positions—including a "bed" position level with the rear seat cushion.

For increased safety, a larger, deeper windshield provides greater visibility. New horizontal-oval tail lights give illumination to the sides as well as to the rear of the car. All '59 models can be equipped with a conventional, overdrive or Flightomatic transmission. Also, the Twin Traction "non-slip" differential is available optionally on all models, as are power brakes and air conditioning. Power steering is optional on V-8 models. The automatic Hill Holder is offered optionally on all models, except those with Flightomatic transmission.

All 1959 models feature large, self-centering, self energizing brakes; full-pressure engine lubrication; a heavy-duty crankshaft; exclusive "heat dam" pistons and an automatic choke.

Using plastics in large-panel repair

• AS THE FORMULAS of plastic dent repair pastes are improved by their manufacturers, the compounds are becoming more generally used in body repair work—even in such large areas as the roof of this Impala.

When it was brought into Dahl Chevrolet, Oakland, California, service department manager Harvey Cooper decided to use "TAP" formulations, "Flex Bond" and "Hot Stuff."

Above (cut 1) is a view of the damaged car before work was begun, showing the extensive damage. After the dented roof had been tool-straightened and heated to relieve stresses, a No. 24 grit disc was used (2) to give "a tooth" for bonding.

Next step was to apply the welding paste (3), spreading it smoothly and pressing it firmly into place. This new formulation is claimed to harden in only 20 minutes, without the use of a "speed promoter" agent. Filing to the required contour (4) followed — a much faster operation with plastic than with metal—after which the file marks were sanded off. Final touch-up (5) was with "Hot Stuff," said to harden to a glazed surface free of pits or pinholes.

Priming and painting finish off the work smartly, as shown below. According to the shop, use of the plastics cut labor time by 10 hours; eliminated danger of excessive warping.

Servicing air conditioners

With the increasing number of cars being air-conditioned for passenger comfort, a profitable business of installing, testing and servicing the units awaits the shopman who understands how and what makes them work.

Part V—Ford Air Conditioning Units

• SINCE FORDS will be the biggest air conditioning service market in the group—Ford, Thunderbird, Mercury, Lincoln, Edsel, Continental—let's get on "speaking terms" first with Ford car units. We will then be able to review the similarities and differences in the air conditioning systems of the rest of the "family."

Fundamentals that apply to automotive air conditioners generally, apply of course, throughout the entire Ford line. But layouts and controls range all the way from interesting to baffling—until explained.

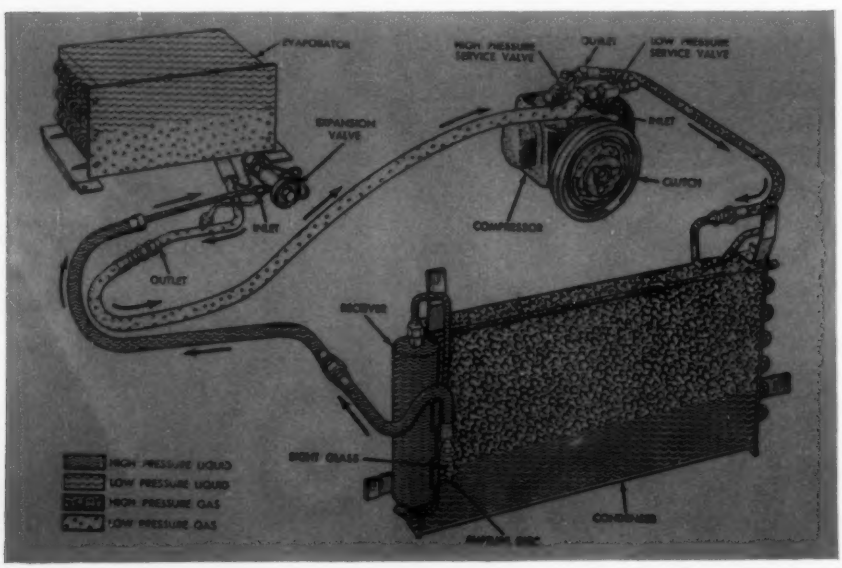
The basic layout as applied to the Ford cars is seen in Fig. 1, but most interesting from the service standpoint is the use of a *pair* of evaporators (cooling units) connected in parallel to the single compressor on Continental and Lincoln installations (Fig. 2). Understandably this additional "plumbing" makes necessary closer attention to the possibility of leaks through which refrigerant would be lost.

HANDLING REFRIGERANT

All cars of the Ford family use dichlorodifloromethane. But speaking the language that we all know, the refrigerant is Freon-12 or equivalent. So when the following discussion refers to refrigerant, it is "du Pont's Freon-12;" General Chemical's "Gentron 12;" or Penn Salt Company's "Istron 12." For the purpose of this article, it is all the same.

Its safeness rests with you. Remember that the refrigerant at normal atmospheric pressures and temperatures evaporates so quickly that it tends to freeze anything that it touches. For this reason take great care to prevent any liquid refrigerant from touching your skin, especially from getting in your eyes. Remember, the entire refrigerating system of any automobile is under pressure. Always wear safety goggles when servicing any part of the system that would contain refrigerant.

Furthermore, since the system is tightly sealed, heat applied to any part causes pressure to build up excessively. So never weld, use a blow torch, solder, steam, or finish baking lights in the immediate area of any part of



By Ed Packer
Member, S.A.E.

Fig. 1—Basic layout of standard Ford "Select Aire" systems.

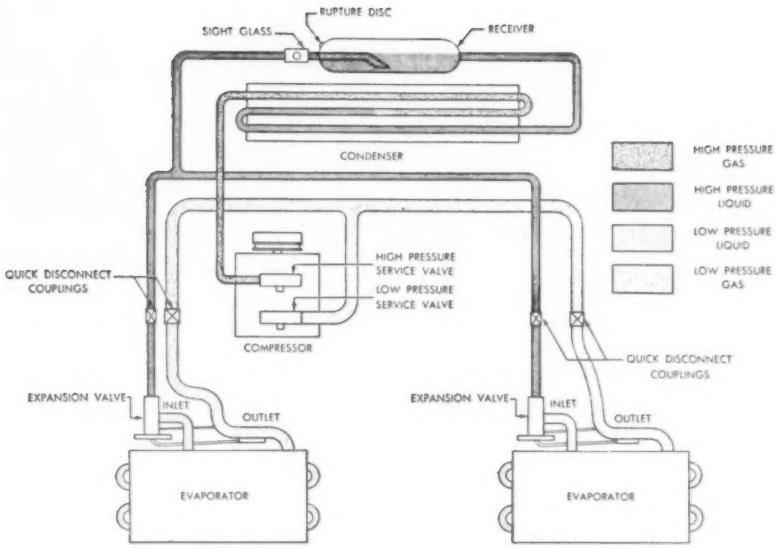


Fig. 2—Lincoln-Continental cars have the dual evaporator system, two cooling units connected in parallel to one compressor.

the air cooling system or refrigerant supply tank while they are closed to the atmosphere. This applies whether they are filled or not.

The refrigerant evaporates so rapidly that the resulting gas displaces the air surrounding the area where the refrigerant is being released. So never open a system in an enclosed area. Be sure of adequate ventilation.

While refrigerant gas under normal conditions is not poisonous, it becomes very poisonous when introduced into an open flame. It is also corrosive, and will attack bright metal surfaces. This poisonous gas is generated in small quantities when the flame-type leak detector is used. So avoid inhaling the fumes from your leak detector.

Always keep the refrigerant tank in an upright position when charging a system. If the tank is on its side or upside down, liquid refrigerant will enter the system and may damage the compressor (Fig. 3).

MAINTENANCE OF FORD SYSTEMS

Two air conditioning units are currently available for Ford cars. These are the "Select Aire" conditioner and the "Polar Aire" conditioner. From the refrigeration angle the two are substantially the same. Each uses a receiver, an expansion valve, an evaporator, a compressor, and a condenser. In addition, the Select Aire unit uses a liquid sight glass, an oil separator integral with the compressor, a cooling unit thermostatic switch, a heater thermostat, a heater core, a blower assembly, a control unit, and the necessary connecting wires, ducts, and hoses. The entire Select Aire layout in schematic form is shown in Fig. 1; the electrical controls in Fig. 4.

The Polar Aire air conditioner is the same as the Select Aire except for the evaporator, which is different in shape (see Fig. 5), separate from the heater, and mounted under the center of the instrument panel. It has no additional air ducts, and all controls are integral with this cooling unit.

On any air conditioning system maximum efficiency requires just the right amount of refrigerant. The factory recommendation is that this be checked every thousand miles. Do this by watching the sight glass (Figs. 1 and 2) for about one minute with the engine running at 1500 rpm and the cooling controls set for maximum cooling effect. If no bubbles appear in the liquid behind the glass, it may be assumed that there is enough refrigerant in the system provided that the cooling system is in working order. If bubbles are seen, add refrigerant to the system, using a hookup as in Fig. 3, or adding refrigerant from a smaller container, until bubbles no longer appear behind the sight glass. Then add an additional pound of refrigerant. This applies to all the cars.

CHECKING COMPRESSOR OIL LEVEL

The oil level of the compressor need not be checked as long as the air cooling system is operating satisfactorily. Actually there's no place for the oil to go except round and round inside the sealed system. Should any portion of the refrigerant be replaced, however, or should the refrigerant leak out and have to be replaced, the oil level should be checked at that time.

Before checking the level, the fully charged system should have been operating for 15 minutes at 1500 engine rpm. Then stop the engine and isolate the compressor. To isolate the compressor from the system, turn both the high and low pressure service valves to the extreme clockwise position (Fig. 6). Both Tecumseh compressors and Lehigh compressors (Fig. 7) are used on the various Ford systems.

Remove the oil filler plug from the compressor *slowly*. Any small amount of refrigerant left under pressure in the compressor will escape harmlessly as the oil filler plug is removed.

With a six- or -eight-inch length of clean wire, check the oil level in the compressor; and add oil if necessary, according to the following specifications:

Compressor Oil Specifications

Car	Height on Dipstick	Brand
Lincoln and Continental	1¼"-1½"	Sunisco "5G" or Capella "E"
Mercury	312" Engine ¾" plus 368" Engine 1½-2"	Sunisco "4G" or Capella "D"
Edsel	Vertical Comp. 1¼" Horizontal ⅞"	Capella "D"
Ford	¾"	Sunisco "4G"
Thunderbird	¾"	Sunisco "5G"

(Turn compressor by hand if crankshaft is in way of dipstick.)

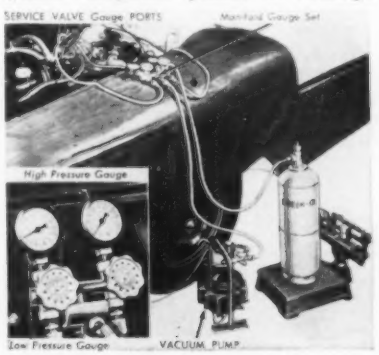
Install the oil filler plug. While tightening the plug, just "crack" the low pressure service valve enough to allow refrigerant to enter the compressor crankcase. The refrigerant, being heavier than air, will go to the bottom of the crankcase and force the air in the crankcase to be expelled through the filler plug.

The compressor is cut back into the system by opening fully the valves (Fig. 6) that had been closed when isolating the compressor.

COMPRESSOR BELT ADJUSTMENTS

Satisfactory belt life and good cooling action are both dependent upon proper belt tension. For proper belt tension, Ford suggests a fixture such

Fig. 3—Test and service connections and units. Note vacuum pump for evacuating system, refrigerant cylinder for recharge.



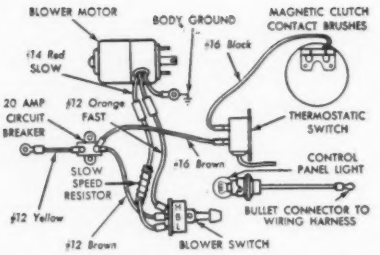


Fig. 4—Electrical control circuit of the Ford "Select Aire" conditioning system.

as the one seen at the left in Fig. 8. This is made from any suitable straight-grained wood. Dimensions are shown in the illustration.

In use, this 14-inch board with the little belt deflector on the underside at the center is held against the water pump pulley. Then the free end is pushed down by a push-type scale, as pictured at the right in Fig. 8. It should take just 11 pounds of pressure to force this fixture into contact with the air conditioning compressor pulley. If the pressure is greater, slack off on the belt. If the pressure required to make contact is less, tighten belt.

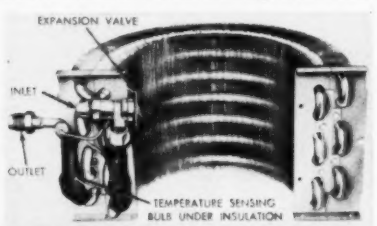
CHECKING SYSTEM PRESSURES

Correct high and low pressure readings in any cooling system are the basic needs for satisfactory operation. The starting point for system pressure tests is the installation of the high and low pressure gage set (see the inset in the lower left of Fig. 3).

To check the system pressures, have all controls set for maximum cooling, the front of the car at least 5 feet away from any wall, and the engine speed maintained at 1500 rpm.

Pressures are greatly influenced by the temperature of the surrounding air. However, pressures should maintain an approximate differential ratio of 6 or 7 to 1. That is, the low pressure may be 16 to 25 pounds while the high pressure would be from 100 to 180 pounds. This would be expected where the surrounding air temperature is 75 degrees Fahrenheit. However, in surrounding air temperatures of 100 to 110 degrees Fahrenheit the high pressure may go as high as 300 pounds.

Fig. 5—Curved core assembly of the "Polar Aire" system (top) and (below) the entire installation with its integral controls.



You may get a reading where the low pressure is below normal, yet the high pressure is normal. Such readings point to a restriction between the receiver and the expansion valve, or between the expansion valve and the low pressure service valve. If the low pressure is actually a vacuum, the expansion valve is probably closed tight. In a case of that kind, turn off the engine and allow the system time to warm to room temperature. Then start the engine, and if the evaporator will now become cool, the expansion valve was frozen because of moisture in the system. The cure is to release the refrigerant, replace the dryer-receiver assembly, check for leaks, then charge the system.

Watching both gages, if you find the low pressure above normal and the high pressure normal, the expansion valve is not operating properly. This condition may cause the compressor to receive slugs of liquid and thus be very noisy.

Another check on this is frosting up on the suction side of the compressor. The expansion valve in a case of this kind will allow too much liquid refrigerant to flow to the compressor if it is defective. You may have this trouble also *if the temperature sensing bulb is not making close contact with the evaporator outlet pipe.* Be sure that the bulb is properly clipped to the outlet pipe and well covered.

(It may be necessary to test the expansion valve itself in investigating pressures that indicate some malfunctioning. The proper procedure will be described separately.)

In a case where the high pressure is below normal and the low pressure is above normal, the compressor may be defective. This is especially likely if the two pressures are equal within 30 pounds of each other. In a case of this kind, most shops would likely prefer to handle the compressor service or exchange with their nearest car dealer.

If high pressure only is above normal, it may be due to an overcharge of refrigerant. Other possibilities include air in the system, condenser air passages clogged, a restriction between the condenser inlet and the receiver, or just high surrounding air temperatures. Sometimes

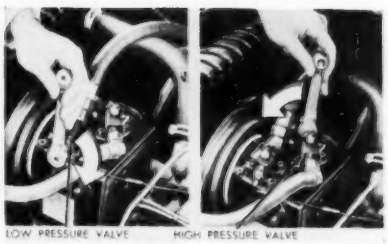


Fig. 6—Adjusting service valve gage ports on compressor with special valve wrench.

the car owner will be tipped off to high compressor pressures; but he will explain the condition as a noisy compressor.

Bleeding the system (*wear goggles!*) by opening a connection partially and slowly, will relieve both an overcharge of refrigerant and entrapped air.

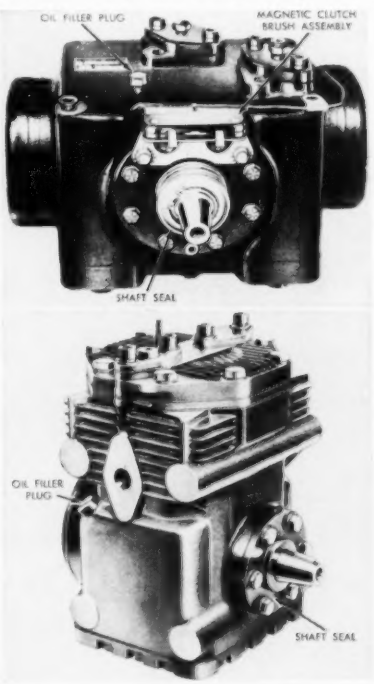
Incidentally, whenever the system has been opened three times, the receiver-dryer should be replaced as a precaution against icing of the distributor tubes.

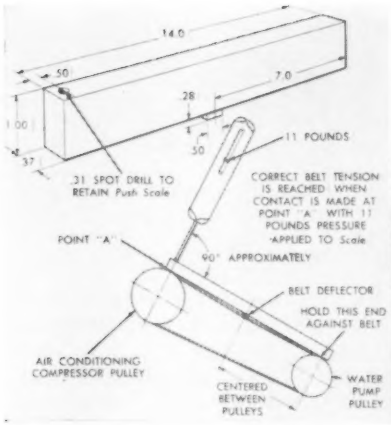
EVACUATING THE SYSTEM

Whenever replacing any part of the system except the compressor it is necessary to discharge the refrigerant completely. This requires care. Don't ever "open 'er up and let 'er blow". You can get hurt this way, and you'll blow the oil out of your compressor.

Start any discharge operation by

Fig. 7—Location of the oil filler plugs in Tecumseh (top) and Lehigh compressors.





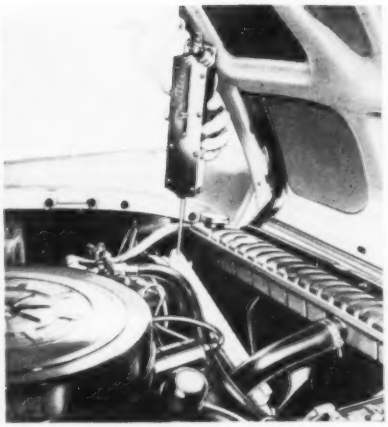


Fig. 8—Details on making a belt tension tester and using it with push type scale.

installing the manifold gage, (as in Fig. 3), but do not connect the manifold center connection hoses to the refrigerant tank or to the vacuum pump. Place the open end of the hose in your garage exhaust system if you can do so readily. Turn the high pressure manifold gage valve to its maximum counterclockwise or open position. Then open the high pressure service valve on the compressor slowly and slightly, and allow the refrigerant to discharge gradually from the system. If the refrigerant rushes out, so will the compressor oil.

PREPARATION FOR RECHARGING

Moisture is a trouble maker in any refrigeration system. And moisture is ever present in the atmosphere. So never leave a system open to the atmosphere longer than absolutely necessary. And when replacing lines or other parts, do not remove their sealing caps until ready to make the installation. And even though you are this careful, *evacuating the system to remove all moisture should precede complete recharging.*

Connect the manifold gage set, a tank of refrigerant, and a vacuum pump to the system, as shown in Fig. 3. Be certain that the refrigerant tank valve is tightly closed. Open both service valves to the mid position, and open both manifold valves. Allow any pressure in the system to escape—its total escape being indicated by zero reading on the low and high pressure manifold gages.

Evacuating the system of moisture is accomplished by running the vacuum pump to a low pressure gage reading of 25 inches of mercury, and preferably down to 30 inches. Let this vacuum continue to "suck" on the system for 20 to 30 minutes. This will "boil" any moisture out of the system. While the vacuum pump is still running, close the pump valve and turn off the pump.

PARTIAL REFRIGERANT CHARGES

Occasionally there may be a slight leak at some fitting, detected by the testing torch and corrected by merely tightening the connections. Then a partial charge is in order.

To make such a partial charge, it is not necessary to first evacuate the system. Attach the manifold gage set as in Fig. 3; close the vacuum pump valve; open the refrigerant tank valve. Purge the air from the high pressure hose by loosening the high pressure hose at the service valve for a few seconds. Then tighten the connections and set the high pressure manifold gage valve at the maximum clockwise position. Loosen the low pressure gage hose slightly at the low pressure service valve for a few seconds to purge the air from this hose. Tighten the connection, and set both service valves at the center position.

Run the engine at 1500 rpm with all controls in the maximum cold position. Charge the system until all bubbles disappear from the sight glass. Then add one additional pound of refrigerant and shut the refrigerant tank valve. This extra pound is correct for all Ford cars and systems.

Experience indicates that it may be necessary at times to place the refrigerant tank in a container of hot water (not hotter than 150 degrees Fahrenheit). This will expand the gas and force it from its tank during charging. *Never* heat the refrigerant tank with a torch. A dangerous explosion may result.

With the system recharged, close both service valves, remove the gage set, and cap the service valve gage ports and valve stems.

COMPLETE REFRIGERANT CHARGES

When the system has been evacuated, as previously described and the manifold gage set installed, set both service valves at the mid position and close the vacuum pump valve. Leave the *low pressure* manifold gage valve at the full *open* position. Set the *high pressure* manifold gage valve at the *closed* position. Adjust all car controls for maximum cooling.

Open the refrigerant tank valve and run the engine at 1500 rpm. Watching the scale under the refrigerant tank, weigh 3.5 pounds of refrigerant into the system—Lincoln and Continental take 4-4½ pounds. The high pressure side tends to build up excessively while recharging: *Never allow* it to exceed 240 pounds; if it does, stop the engine until the pressure goes down.

When the proper charge is in the system no bubbles will be seen in the sight glass. Bubbles begin to disappear when approximately 2.5 pounds of refrigerant are in the system (3.5 pounds for Lincoln-Continental.) Then the system can still hold about 1 pound more refrigerant to advantage. But don't overdo it.

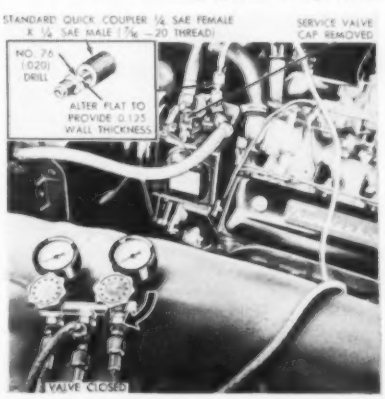
After a complete charge, set both service valves at the maximum counter clockwise or open position. Remove the gage set and cap the service valve gage ports and valve stems.

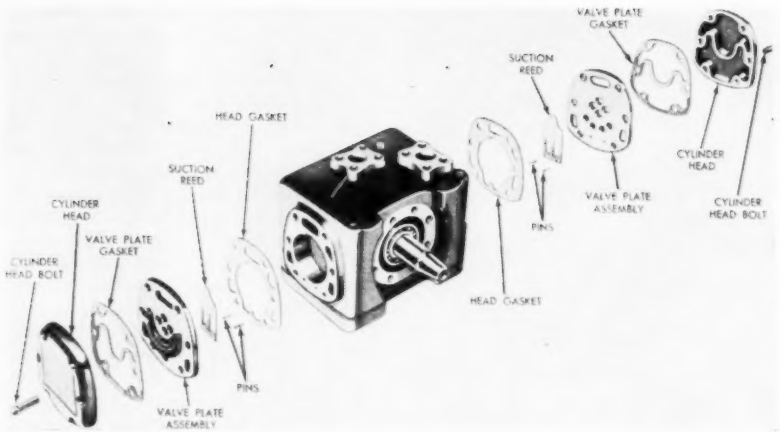
Upon completion of this recharge it is well to check system pressures as previously described.

CHECKING COMPRESSOR VOLUME

Compressor efficiency is checked by the volumetric test, which should be made in an atmosphere as clean and dry as possible. Begin by running the engine at 1500 rpm for 10 minutes with all controls at maximum cooling position. Then adjust the engine idle with a tachometer to exactly 515 rpm with the compressor clutch engaged. Turn the engine off and set the cooling controls in the OFF position. Isolate the compressor. Then remove both high and low pressure service valve

Fig. 9—Checking the volumetric efficiency of the air conditioning system compressor.


STANDARD QUICK COUPLER ¼ SAE FEMALE X ¼ SAE MALE (7/16 — 20 THREAD)
SERVICE VALVE CAP REMOVED
NO. 76 (.020) DRILL
ALTER FLAT TO PROVIDE 0.125 WALL THICKNESS
VALVE CLOSED



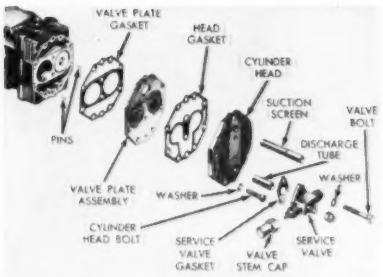


Fig. 10—Valves and related parts of the Lehigh (left) and Tecumseh compressors.

gage port caps, allowing the gas in the compressor to escape.

Through your Ford dealer, obtain a tool of the kind seen in Fig. 9. This has a calibrated orifice, and is connected to the high pressure service valve gage port.

Connect up the high pressure gage, as shown in its illustration, and start the engine. Engage the magnetic clutch for 15 second intervals, by moving the cooling control from the OFF position to the maximum cooling position. Observe the gage pressure at the end of each 15 second interval. Be sure that you allow the gage pressure to drop to zero between the 15 second intervals. Stop the engine.

A good compressor will bring the pressure to 200 p.s.i. in 15 seconds in spite of the loss of pressure through the calibrated tool. If the pressure does not come up to 200 p.s.i. in 15 seconds, clean the compressor intake screen. If the intake screen is clean, remove and inspect the valve plate. The valve plate and related details for the Lehigh and Tecumseh compressors are seen in Fig. 10. Generally, failure to come up to 200 p.s.i. in 15 seconds is caused by small particles of foreign matter under the valve plate reeds, or by a defective valve plate. Clean the valve plate and assemble it to the compressor, using new gaskets. If this does correct the condition, it would be best to check with your car dealer and replace the valve plate or the compressor as required.

If no further work is to be done on the system after making the volumetric efficiency test, disconnect the orifice tool and gage, evacuate the compressor, and connect it back into the system.

THERMOSTATIC SWITCH TEST

The thermostatic switch shown in Fig. 11 must be removed from the evaporator for testing. Set the switch cam at the coldest temperature setting. Place the sensing tube in a glass filled with finely crushed ice and water—32°F. If the switch clicks, it is defective and should be replaced. If it does not click, leave the centering tube in the ice and turn the cam counterclockwise until a click is heard. The cam should move approximately 1 16 inch from the cold setting stop which represents the 32°F. setting, or the temperature of melting ice.

With the sensing tube still in the ice, turn the cam back to the cold temperature setting. If the switch clicks, it is defective and should be replaced. If the switch does not click remove the unit from the ice and expose the sensing tube to air of approximately 75°F. The switch should click almost immediately after removal from the ice. If it takes longer than 5 or 6 seconds for the switch to click, it is defective and should be replaced.

If the surrounding air to which the switch is exposed is hotter or colder than 75°F., it will cause the switch to click sooner or later. It's a good stunt to have a spare switch on hand for comparing the action.

Fig. 11—Ford system thermostatic switch.

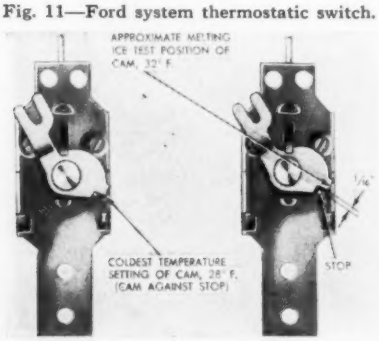
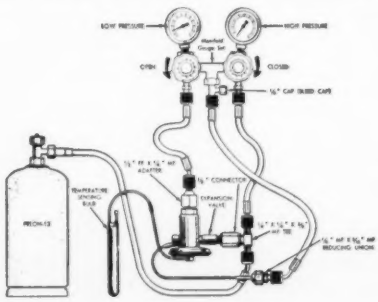


Fig. 12—Expansion valve test connections.



EXPANSION VALVE TESTS

A setup as pictured in Fig. 12 is needed for an expansion valve test, which requires that the expansion valve be removed from the evaporator. Note that the high pressure gage will read tank pressure, and the low pressure gage will read the expansion valve outlet pressure.

The pressure limit test is made by leaving the temperature sensing bulb at air temperature, and opening the refrigerant tank valve. Observe the pressure at which the needle of the low pressure gage stops rising, or at which it slows abruptly. There should be a minimum of 60 p.s.i. on the low pressure side. Obviously tank pressure must be 60 p.s.i. or higher.

If the low pressure gage reads zero, there is a dead temperature sensing bulb or a plugged orifice. If the gage reads low, the temperature sensing bulb has partially lost its charge, or the valve is improperly adjusted.

Immerse the sensing bulb in crushed melted ice (32°F.) for the adjustment test. If all the low pressure joints are tight, the low pressure will not drop. If necessary, use a leak detector to find any leaks.

Open the bleed cap (Fig. 12) slightly, and allow the low pressure to drop. Then alternately close and open the bleed cap several times, and note the low pressure reading with the bleed cap open slightly. The gage should show 24.5 pounds plus or minus 1.5 pounds. No adjustment can be made if the valve does not meet this test. Any defective valve should be replaced by a new one.

Needle tightness tests are made by

leaving the temperature sensing bulb in the crushed ice and closing the bleed cap. The low pressure for a good valve will increase a few pounds, and then either stop or build up very slowly. A leaking valve will cause the low pressure to build up rapidly until it equals the inlet pressure.

So much for the maintenance, trouble shooting, and repair of the refrigeration phase of the air conditioners used on the various cars of the Ford group.

CHECK ANTI-FREEZE

Where the air conditioner is combined with the car heater, be sure to check the anti-freeze in the cooling system—yes, even in mid-summer. Since the evaporator of the air conditioner and the core of the heater are in the same housing it is possible to freeze the heater core unless the cooling system is protected down to about 20°F. or colder with an ethylene glycol base anti-freeze.

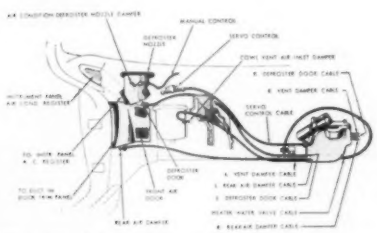


Fig. 13—Lincoln-Continental controls.

The next thing to consider in making an air conditioning system satisfactory to the owner is the circulation of the cooled air within the car.

Understandably the basis of circulation is a good electric fan in the evaporator or cooling circuit. Since this fan and its controls are substantially identical to the fan and controls of the hot water heater, trouble shooting in this category will be left to your understanding of such basic services.

SERVO-MOTOR CIRCUIT

Continental-Lincoln controls of car heating and cooling are something else again. It may be the part of wisdom to leave the servicing and adjusting of these controls to the car dealer. It is interesting and helpful, however, to be familiar with this highly developed control system.

The single control knob mounted on the instrument panel is all that concerns the driver. Blower operation is provided by moving the control knob in or out. When the knob is all the way in, the blower motor is off. Halfway out provides low blower operation. But there's more—much more.

A schematic of controls is seen in Fig. 13. These are all actuated electrically. A servo motor circuit runs from the ignition switch, through a 6 amp circuit breaker, to the motor. A mechanic's eye view of what goes on in the motor and servo evaporator control switch, as well as the levers and cables that actuate the entire air conditioning-heating system, and accurate identification of these elements,

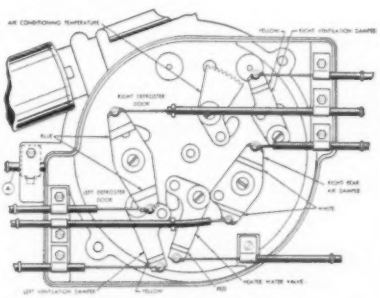


Fig. 14—Detail of the servo arm and cable.

are presented in the detailed drawing, Fig. 14.

Direction of rotation of the electric motor (indicated in cut off section at the upper left corner) is determined by the position of a movable arm terminal either outside or inside the insulator strip. This is due to the fact that one stationary terminal always contacts inside the insulator strip, and the other outside the insulator strip.

When the movable arm is moved off the insulator strip it completes a circuit to ground to operate the servo motor. As the worm gear rotates, it drives the contact plate. Grooves provided on the back of the contact plate move the actuating levers.

From the foregoing, one should be able to detect and correct a fault resulting from a cable that has become detached, or something of that order. But in general, the major servicing and adjusting of the Continental-Lincoln controls would best be left to the car dealer.

"Do you want to stop by for it, or would you like us to mail it to you?"

Tool Tips *for the Mechanic*

Dynaflow Transmission Service

You can pull the front pump seal on Dynaflow transmissions without disassembly if you use Snap-on® CJ-66-24A Oil Seal Puller. Tool threads into oil seal and pulling is done with the 66-1 Slide Shaft and 66-2 Booster Hammer. Tools are described in Snap-on Catalog W—page 99. Ask your Snap-on dealer.

Torquing Pontiac Head Bolts

Cylinder head bolts on 1958 Pontiac V-8 engines can be torqued easily with a Snap-on S-8683 ¾-inch Boxocket® and a TQ-150 Torqometer. The S-8683 also handles cylinder head bolts on small 1958 Ford, Mercury and Edsel engines. Pages 35, 69, Snap-on Catalog W.

NEW TOOL

Snap-on MT-20 Throttle Idle Control Clamp

An extremely useful tool for controlling engine idle speed while making tests with the Snap-on Anal-O-Scope or other electrical test equipment.

Attach bracket of tool to throttle rod and tighten into position with knurled screw. Place other end of tool on any available brace, then turn adjusting nut until motor idles at desired speed. Tool is easily removed. Motor returns automatically to original idle—no need to adjust idle stop screw. Tool is brand new—not shown in Snap-on Catalog W. Check your Snap-on dealer or write us.

Cadillac Caster-Camber

1957 models are adjusted easily by cutting front wheels sharply and using Snap-on NS-24 Nut Spinner Handle, SX-36 Extension Bar and SU-26 Flexocket. Snap-on Catalog W—pages 19 and 21.

Edsel-Mercury Distributor Work

The Snap-on S-9476A ½-inch Double Hex Boxocket quickly removes or loosens distributors on Edsels and Mercurys, where distributor is mounted at the front of the engine. This wrench is a special, originally designed for Chrysler, DeSoto, Dodge and Plymouth distributors. Page 70 of Snap-on Catalog W.

Get your copy of the new Snap-on Catalog W. Ask your Snap-on man or write direct. Watch for further Tool Tips in future issues of this publication.

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Emergency Starting Unit

A portable, compact and easy-to-carry emergency starting unit, which enables one man to start a 6- or 12-volt vehicle, even in the limited space of a one-car garage, is announced by United Motors Service.

Known as the Start-O-Pak, the unit

is equipped with a remote control button which operates a solenoid switch which permits activating the unit from the driver's seat of the vehicle. Cables are "electrically dead" until the Start-O-Pak is activated by the remote control button, eliminating sparking at battery terminals and chances of fire or battery gas explosion.

The unit's heavy-gauge steel, electrically welded case forms a rugged container for the battery, charging unit and solenoid switch. The piano-type hinged cover has a convenient carrying handle. Outside of the case is finished with acid-resistant plastic enamel, the inside with a heavy baked-on coating of acid-proof vinyl plastisol.

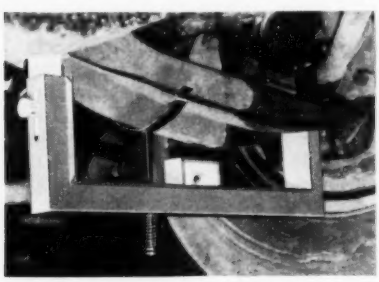
The 12-volt built-in charging unit is said to make it easy to recharge the starting battery, by plugging into any 110-115 volt, 60 cycle, AC outlet. The charger is water-proofed and provides a self-regulated tapering charge.

(Circle No. 1 on Reader Service Card)

Torsion-Aire Height Gauge

A new Torsion-Aire Height Gauge is announced by Snap-on Tools Corp., designed especially for use on all Chrysler products equipped with Torsion-Aire suspension.

The gauge consists of a metal frame 16" long, with an "arm" at each end



and with a highly accurate, easy-to-read liquid level mounted on the frame between the arms. One arm is stationary and has a "C" shaped shoe on top, designed to bear firmly against the lower edge of the ball joint nut. The opposite arm has a movable sleeve, adjustable to manufacturer's recommended height settings. This sleeve is calibrated in 1/16" increments from 1½" to 3". A thumb screw on the side of the arm is used to secure the sleeve at the desired setting.

The liquid level is equipped with a 2 sided scale, is of the "see through" type and is calibrated in increments of 2°, measuring up to 40° on either side of zero. A gauge retaining spring mounted next to the level holds the gauge to the flange of the lower control arm during tests. For added convenience, an aluminum 1⅜" x 3" Torsion-Aire height differential chart giving the manufacturer's recommended height specifications, is attached to the frame on the opposite side of the level.

(Circle No. 2 on Reader Service Card)

"Power Points" Contact Sets

Recently announced by The Electric Auto-Lite Co. are "Power Points" contact sets that are pre-assembled and pre-aligned and have a nylon arm

design for bounce-free performance at high speeds.

Replacement time is said to be reduced 50 per cent with the new "Power Points," and because of design, point alignment is eliminated at time of installation, as well as after a few miles of vehicle operation due to "creepy" breaker arm action. The resilient nylon rubbing-block is said to provide superior wearing qualities and the natural lubricity of the nylon arm reduces rate of high speed point erosion and low speed point transfer. In addition, the new design is said to cut electrical loss through greater creepage distance from mounting stud to ground.

(Circle No. 3 on Reader Service Card)

Manual Choke Kit

A universal manual choke kit is being offered by Superior Screw & Mfg. Co., Inc., for converting faulty

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TECHNICAL HELP FOR THE SERVICE SHOP

AUTOMOTIVE SERVICE DIGEST is specifically edited for the service specialists of the automotive industry . . . the men who keep automobiles on the road, performing at their best. From front cover through the "Smiles" page, all articles and departments are devoted to subjects and services that will help the man in the shop to do a better job, more profitably.

"TECH KNOW-HOW" FEATURES

●ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

"BUSINESS KNOW-HOW" FEATURES

● Covering the "dollar sign" side of our readers' information needs, ASD "Business Know-How" articles present management subjects from the specific automotive service shop viewpoint. They are written for owners and supervisory personnel, by authors of recognized business-management ability; and are based on the actual day-to-day problems of a going automotive service establishment.

AUTOMOTIVE SERVICE EDUCATION

● Toward the solution of one of the most acute needs of our industry, AUTOMOTIVE SERVICE DIGEST carries a continuing series of reviews on how and where the skilled technicians of tomorrow are being trained. Going deeply "into cases," the Service Education series answers the questions of prospective student and management alike.

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automatic chokes to hand operated chokes that offer positive finger tip control from dash panel.

The kit (Aldo #700) has been designed to fit all climatic and non-climatic applications, including late four barrel carburetor installations. For climatic application, a tailored cap is furnished with the kit, which features a spring loaded unit said to prevent the stifling of engine on acceleration.

(Circle No. 4 on Reader Service Card)

The Bowmonk Dynometer

In response to the demand for a low cost, precision instrument capable of giving accurate information regarding the condition of a motor vehicle at any time, Bowser, Monks and Whitehouse,

Ltd. have made available the Bowmonk Dynometer, designed to measure automobile acceleration and deceleration, rolling resistance, road horsepower, and hill gradients.

The Dynometer is a small, compact and attractively finished, precision instrument, easily fitted to the instrument panel or windshield of an automobile or truck. No connections to the engine are necessary as the instrument operates on the principle of inertia. It has a 2¾" circular dial, with two concentric performance dials and counterbalanced needles for easy reading. The whole mechanism is contained in a cream-colored bowl which is gimballed for fine adjustment.

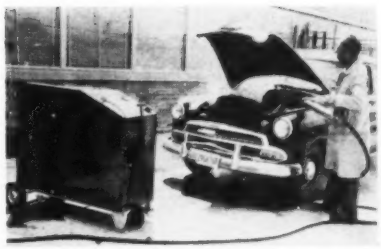
According to the manufacturer, the accelerometer allows accurate automobile tuning, performance checks on the road, economy driving and gradient measurement.

(Circle No. 5 on Reader Service Card)

Portable Steam Cleaner

A low-priced portable steam cleaner, the Model 200 with automatic features and capacity usually found in more expensive portable cleaners, has been added to the Vapor Heating Corp's. "Upgrader" steam cleaner line.

The unit heats, cleans, sterilizes,



de-ices . . . flip of ignition switch starts automatic operation—reaches 100 p.s.i. full operating pressure in three minutes, according to manufacturer. Output: 200 gallons of water or mixed solution per hour. Built-in, self-mixing solution tank has 14 gallon capacity, said to be enough for about 4-hour continuous running.

The unit has a pressure atomized burner (forced draft) system. Continuous spark ignition and spaced, baffled heating coils provide efficient combustion and heat transfer of over 380,000 B.t.u. per hour.

A safety switch gun handle shuts steam off when trigger is released, permitting job interruptions or delays without shutting off entire unit—work is resumed by squeezing trigger-action handle. Both natural gas and fuel oil fired models are available.

(Circle No. 6 on Reader Service Card)

Tune-Up Profits *Plus*
More Parts Business
start with HANSON

4 UNITS PLUS CASE $145.00

NEWEST HANSON TESTERS
Simplified hand-size Hanson Engine Analyzers. Hanson quality throughout . . . large 3⅜" x 2⅜" color-coded dials, chrome-plated cases. Ignition tester Tachometer, Dwell Angle Tester and Amp-Volt Generator-Regulator Tester . . . available separately or as 4-unit set complete with carrying case.

VACUUM-FUEL PUMP TESTER
4-color dial reads to 30" of vacuum . . . 7 lbs. of pressure.

COMPRESSION TESTERS
Large dials calibrated to 250 pounds to test all engines.
Standard . . . stem off-set 15° to reach back cylinders.
Deluxe . . . pistol grip houses extra cones and valves.

STARTER CURRENT INDICATOR
V-shaped bracket on back fits every battery cable.

BATTERY CELL TESTER
With adjustable leg to fit both 6 and 12 volt batteries.

POWER TIMING LIGHTS
Long-lasting accuracy and brilliant white light. Hand-fitting grips, balanced design for easy handling.
Model 9 . . . rugged plastic design, molded pistol grip. Powered from 110 volt A.C. line.
Deluxe . . . all chrome case, trigger switch, plug-in bulb. Powered from car battery.

MOTOR ANALYZING SET
A complete "package job." 7 top quality Hanson Units in handy carrying case. Instruction manual included.

4-UNIT MOTOR TESTER WITH STAND $252.95

ALL 31 HANSON MODELS ARE TOP QUALITY, FULLY GUARANTEED AND COME COMPLETE WITH EASY-TO-FOLLOW INSTRUCTIONS.

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These are new *manufacturers' products*

Universal Choke-Stove

Brake Parts Specialty announces the addition of a universal model Choke-Stove to its line of custom-fit

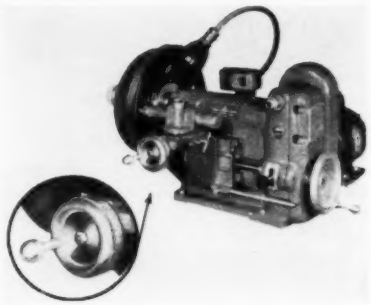
units for use by repair shops wanting general coverage with just a token inventory.

The universal model uses the BPS asbestos pad for draft-proof air tight seal—mounts easily, quickly and securely to any manifold.

(Circle No. 7 on Reader Service Card)

Drum-Dokter Lathe Improved

Announcement has been made by Barrett Equipment Co. that their



Drum-Dokter Lathe is now equipped with a larger micrometer dial wheel which is easier to handle and read. An improved heavy duty cross feed slide and heavy duty ½ hp. motor are also standard equipment.

(Circle No. 8 on Reader Service Card)

Magnetic Particle Testing Kit

A new, low-cost, portable, combination yoke-coil magnetic particle testing kit for detecting both transverse and longitudinal cracks in ferrous parts, is being offered by the Magnaflux Corp. Known as the YL-51, the kit consists of a magnetizing coil, a two-pole yoke, two powder dispensers, one pound each of grey and black Magnaflux powder, two 25-foot power cords, and a metal carrying case.

The complete kit weighs 45 lbs., including metal carrying case, and is designed for one man operation. Both coil and yoke operate from 110-volt, 60-cycle, 1 phase alternating current. Yoke can also be powered from a 12-volt battery.

(Circle No. 9 on Reader Service Card)

Camber Adjusting Problem?
EASY Solution: Houser No. 720

As front suspension parts wear and the front coil springs "set" negative camber results. On 1955-56-57 Chevrolets, positive camber is increased as shims are removed. When all shims are removed, additional adjustment is impossible.

HOUSER'S NO. 720 CAMBER ADJUSTING BOLT permits moving the lower control arm just 1/8" toward the center of the car. This increases positive camber one full degree and allows regular shims to once again be used for final adjustment.

Installation of Houser's No. 720 is easy — no disassembly, no bending, no new parts required. Takes less than an hour to drill and install bolts on both sides.

Fits 1955-57 Chevrolet; 1957-58 Buick
Positive • Permanent • Profitable
WRITE TODAY for Catalog and Prices

HOUSER ENGINEERING & MFG., INC.
BLUFFTON, INDIANA

FOR LIVE WIRES ONLY

THE MASTERFUL SECOND EDITION OF THIS POPULAR BOOK IS NOW READY

The new chapters on The Automotive Oscilloscope and Tune-Up Procedure alone are worth the price of the book! It is a "Gold Mine" of information.

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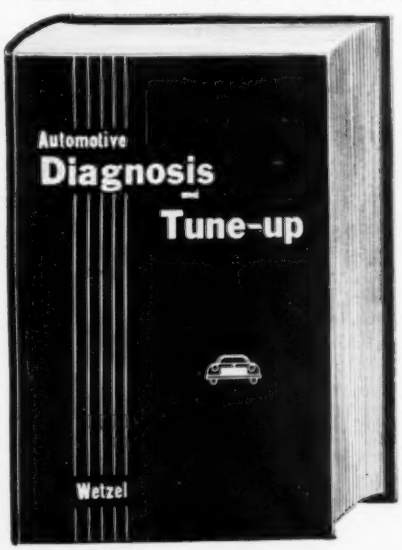

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Simple as: A-B-C

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B PARTS PRICES. Factory list prices cover all makes, all body styles for past eight years—convertibles and hardtops included.

C ILLUSTRATIONS. For quick identification—fast and accurate body shop estimating and billing. This section shows exploded views of front and rear suspensions, grilles, power steering—front sheet metal including sub-assemblies and bumper—body diagrams, indexed by make.

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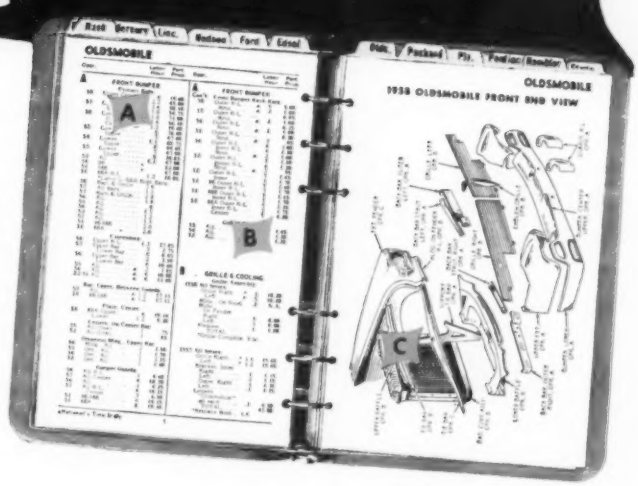

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DOMESTIC CARS

MOST Complete Service at the Lowest Cost $18.00

National's P & L Master Manual—Domestic Cars—takes the guess out of estimating and billing—boosts body and service shop profits. For only $18.00 you get up-to-the-minute *replacement revisions* that normally total more than 1300 pages annually.

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Now included with the latest figures, illustrations and exploded views on all models.

EASIEST TO USE

National's Manuals (both Domestic and Import) are divided into two "fast-find-it" sections:

1. Collision Section—with all operations arranged in logical sequence.
2. Chassis Mechanical Section—covering all other repair services.

A NEW SERVICE
IMPORT CARS

Sequence of operations, parts prices, labor hours and illustrations in similar comprehensive form as National's Domestic Car Manual.

This Master Manual for Import Cars initially includes:

- Volkswagen
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- Metropolitan
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Additional makes at frequent periods will give coverage to at least 15 group and independent lines by April, 1959.

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(MO)

These are new *manufacturers' products*

Portable Tachometer

Kal-Equip Co. announces a new high tension tachometer that is said to service all types of gasoline engines whether inboard or outboard, magneto or battery ignition, 2 or 4 cycle, regardless of voltage used.

The new tachometer connects to any convenient spark plug on any motor, and simplified operation and easy-reading dials are said to make both high speed tests and idle speed setting fast, sure and easy.

The new unit features one-hand operation with only two simple thumb controlled switches for selecting 2 or 4 cycle operation and high range (0 to 8,000 r.p.m.) or low range (0 to 800 r.p.m.). In addition, the manufacturer claims that the tach has exceptionally low load characteristics which means that the unit can't cause motor misses during testing, and consequent inaccuracy.

The mechanism is protected in

a shatterproof, corrosion-resistant chrome plated case, and has internal protection against burnout, battery failure, and shock.

(Circle No. 10 on Reader Service Card)

Keeps Floors Clean, Like New

Oils, greases, liquids, and their odors, are said to be absorbed thoroughly and quickly by the mineral absorbent Sol-Speedi-Dri, manufactured by Minerals & Chemicals Corporation of America. Sol-Speedi-Dri's great "thirst" and capacity for these materials without becoming wet itself have put it into a great number of wide-ranging uses. Dustlessness and inertness also help to make this product such a truly all-purpose absorbent.

Biggest use of Sol-Speedi-Dri is in keeping floors dry, clean and safe. Because it is granular and does not break down into smaller particles under traffic, Sol-Speedi-Dri spreads easily when applied, and does not pack down. It is said to restore wood floors long-saturated with oil or grease, and remove similar accumulations on concrete floors. Both types of surface are restored to like-new appearance and to safe walking conditions. Sol-Speedi-Dri is removed simply by sweeping or brushing.

(Circle No. 11 on Reader Service Card)

Shurhit

World's Finest

Ventilated Contact Sets

Tune-up starts at the heart of an ignition system — the distributor. Always replace BOTH the points *and* condenser. Shurhit's catalog lists Regular and Ventilated Sets for every Ford, Mercury and Lincoln replacement need.

Shurhit Contact Sets and Condensers *look better* and *perform better* — because they are MADE better. They have larger contact area, line bored bushings, stainless steel springs, nickel plated bars, precision alignment. That's why mechanics everywhere say Shurhit is the "world's *finest* ignition."

Shurhit Quality IGNITION

Shurhit PRODUCTS, INC.
WAUKEGAN, ILLINOIS
WORLD'S FINEST IGNITION

Cold Parts Cleaner

A new cold parts cleaner that is said to cut cleaning efforts almost 60 per cent by dissolving and washing away hardened foreign coatings from metal surfaces, is announced by Permatex Company, Inc.

The new Permatex product is an immersion type, water sealed cleaner and is marketed in six-gallon containers holding four gallons of liquid.

Purpose of the six-gallon container is to provide enough space for cleaning the maximum number of parts without spillage. The cleaner is supplied in two differently labeled containers—one with a reuseable, sturdy, steel basket with handle, legs and perforated bottom and one container without the basket.

According to the manufacturer, the chemical concentrates are designed to quickly penetrate and break down baked-on carbon, varnish, grease and other deposits from engine cylinder blocks, pistons and carburetor parts, thus eliminating the need of laborious hand scraping or brushing. The water seal prevents evaporation of the cleaning compound and also acts as a rinsing agent.

The manufacturer further states that parts left over night in this new cleaner will not oxidize or discolor and can be rinsed with water without leaving an oil film. Solvent rinsing is not required.

(Circle No. 12 on Reader Service Card)

Power Brake Repair Kits

Five types of power brake repair kits for all passenger cars are now being offered by The Automotive Division of Wagner Electric Corp. Included are single package kits, which contain all parts normally required in a complete overhaul; major and minor kits, which contain gaskets and rubber parts for major or minor overhauls; packing kits, containing power piston leather packing or power diaphragm, as required, plus related parts; and poppet valve kits which contain pop-

pet valve parts for complete replacement.

Each kit contains clear instructions for step-by-step disassembly, repair and assembly.

(Circle No. 13 on Reader Service Card)

Twin-Post Repair Stand

Designed for servicing heavy truck engines, differentials and transmissions—and for handling any engine requiring dual support—this new Manzel Twin-Post Repair Stand utilizes a special heavy-duty outboard support. The fixed height of the support permits the load to pivot directly on the centerline of gravity. Infinite lateral positioning is provided by locking hand wheel clamps.

A newly-engineered flexible mount-

ing plate with 2" splined shaft is built into the stand. It cushions and equalizes alignment stresses in engine block and achieves equal load distribution on both supporting members. Distortion stresses in the mounted unit are said to be eliminated, and in addition, the load pivots freely with a minimum of turning effort.

Another exclusive feature is a contracting, hand-operated, brake-type infinite positioning lock, which is said to hold the engine, transmission or other load immovable, even under the most severe torquing operations, thus making the repair stand a completely rigid work table.

(Circle No. 14 on Reader Service Card)

- Suppliers to Original Equipment Since 1908.
- Featuring: 2 piece (Bi-Metal) Exhaust Valves.
- Heat Banded, Stellite Faced and Aluminized Heavy Duty Valves.

THIS TRADE MARK GUARANTEES YOU "SPECIALIZED" QUALITY

rmc **has specialized, for a half century, in making nothing but valves for the automotive industry. That's why *rmc* valves give more mileage and better performance under every operating condition. Take advantage of this "Specialized" quality—insist on *rmc* valves.**

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Warehoused in all principal cities. Sold by leading Replacement Parts Wholesalers everywhere.

FOR INFORMATION WRITE TO

RICH MANUFACTURING CORP.
BATTLE CREEK, MICH.

These are new *manufacturers' products*

Wheel Cover Tool

A new tool, designed specifically for removing and replacing all makes of automotive wheel covers, is announced by the Vulcan Mfg. Co.

A specially curved single claw extractor does the removal job, even on the tightest covers. A flexible rubber head helps prevent marring and denting, yet is said to drive the cover securely in place.

The head is replaceable, and fits over the tempered alloy steel head, which is secured to a 12" handle.

(Circle No. 15 on Reader Service Card)

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ECCENTRIC
SEAT GRINDING
is faster... better
Save time... make money"
Please send me free information on items checked.
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HALL-TOLEDO's Model EJ Valve Seat Grinder, utilizing an exclusive, eccentric principle, assures quick, economical, perfect valve seating.
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Interchangeable Drying Lamp

A new type dryer for paint and body shops, featuring an interchangeable 750 watt ceramic heat element for fast infra-red drying is announced by the Trippe Mfg. Co.

Heat elements of 500 to 1,000 watts may also be used, simply by unscrewing one element and replacing with another. By substituting any standard medium screw base bulb for the ceramic element, the unit may also be used as a flood light.

The lamp stands on heavy cast iron base equipped with furniture glides for easy moving. Half turn of adjusting sleeve permits raising head up to 76" or down to 43". Head itself is adjustable to any angle.

(Circle No. 16 on Reader Service Card)

Hand-Size Test Instruments

Two new hand-size test instruments are announced by Harvey E. Hanson Co.—a tachometer, and a dwell angle tester.

The tachometer has a $3\frac{3}{8}$" x $2\frac{3}{8}$" color-coded dial which reads from 0 to

1,000 r.p.m. and from 0 to 5,000 r.p.m., and can be used for testing engine r.p.m. on 4, 6 and 8 cylinder engines with both 6 and 12 volt systems.

The dwell angle tester also has a $3\frac{3}{8}$" x $2\frac{3}{8}$" color-coded dial for measuring the dwell angle on 4, 6 and 8 cylinder engines with either 6 or 12 volt systems.

Both instruments use two pen light batteries and require no engine power, making them ideal for road testing.

(Circle No. 17 on Reader Service Card)

Brake Cylinder Repair Kits

A new master and wheel cylinder repair kit assortment program, featuring a free Lisle BHX Brake Hone and steel parts cabinet, has been an-

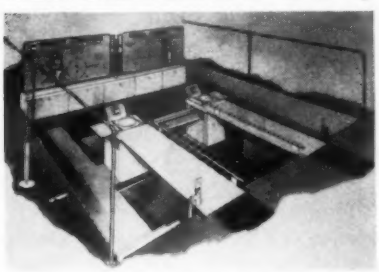
nounced by the Brake Division of Lisle Corp.

The dealer pays only for the 28 wheel cylinder kits and 10 master cylinder kits—the hone and cabinet are furnished at no additional charge. According to the company, the kits in the assortment are the fastest movers in the line and cover the most popular General Motors, Ford and Chrysler products.

(Circle No. 18 on Reader Service Card)

Adjustable, Pit-Type Aligner

Latest addition to the Lite-A-Line wheel aligners offered by Hunter Engineering Co. is a new adjustable-width, pit-type unit. The removable runways are quickly adjustable for vehicle tread-widths of 40″ to 68″ by



moving the turnplate pedestals on sliding steel guide rails.

The aligners include new, improved Lite-A-Line projectors which are said to give magnified super-accurate alignment readings on the front charts, eliminating the need for side charts. According to the manufacturer, a complete front-end check for caster, camber, turning angle, king pin inclination, wheel-track, toe-in and center-steering can be made in five minutes. Only two turns of the front wheels are needed for all readings, and repeated crawling-out from under vehicle to read gauges is said to be eliminated.

(Circle No. 19 on Reader Service Card)

Miniature Wrenches

Armstrong Bros. Tool Co. announces the addition to its wrench line of two 15- and 75-degree angle

opening miniature wrenches. Drop forged of alloy steel, carefully heat treated, and chrome plate finished, these tools fill out a selection of 11 other similar wrenches in various sized openings from 3/16″ to 5/8″.

The new #1136 has 9/16″ openings, the #1140 5/8″ openings. Both are 5½″ in overall length, with heads 3/16″ thick.

(Circle No. 25 on Reader Service Card)

"Spray-Kleen" Car Wash System

The Alemite Div., Stewart-Warner Corp. is now marketing a car-washing system which—at a cost comparable to that of a single lubricant pump—is said to permit an inexperienced operator to wash six cars per hour in a work space no larger than a conventional lube bay.

Known as "Spray-Kleen", the system consists of a high-pressure air-operated pump which first delivers a stream of soapless chemical detergent through an atomizing nozzle onto the vehicle surfaces. After the vehicle has been completely detergent-sprayed and the chemical allowed to "work" for a moment or two, the next and final step is a complete hose-down with a spray of clear water, after which the vehicle is allowed to air-dry.

Because rubbing or "mitting" are

said to be unnecessary, there is no danger of abrasive action—the detergent chemical-and-water mixture is said to do the entire cleaning job by wetting, penetrating and loosening every type of "dirt," including bug-residue, grease and other surface soiling matter. Glass and chrome surfaces are said to be restored to clean brightness, and wax or other surface protecting treatments are not disturbed.

(Circle No. 26 on Reader Service Card)

"I CLEAR $290 A MONTH ON MUFFLERS AND PIPES with my Superior Air Hammer"

Says Ernie Olchon,

OWNER PURE OIL BAY SERVICE, BAY VILLAGE, OHIO

"My Superior Air Hammer Removes Muffler and Pipe in 3 minutes"

"Now Muffler Installations Are Quicker Than Lube Jobs"

Cash in on the growing muffler replacement market. With Superior's Metering Trigger, semi-skilled help can control blows from 0-2800 per minute — remove the toughest mufflers and tail pipes in just three minutes without damaging or distorting the pipes. Hammer weighs 3½ lbs., operates on your standard compressor.

Complete kit

1— SP-700 Hammer
1— #415 Muffler Cutter
1— #430 Flat Chisel

$79.95

For full details, ask your jobber or write direct

SUPERIOR PNEUMATIC & MFG., INC.
4758 Warner Rd. • Dept. D-10 • Cleveland 25, Ohio

These are new *manufacturers' products*

Parts Cleaning Machine

Magnus Chemical Co., Inc., announces a new, compact, low cost Miji Lift Cleaning Machine suitable for cleaning small blocks, heads, engine parts and automatic transmissions.

The Standard Model, made to accommodate small automotive parts, has a working space 21″ x 18″ x 12″ and a load capacity of 75 lb.; while the Senior Model, designed to accommodate longer and heavier pieces, is 29″ x 18″ x 12″, and has a load capacity of 100 lb. Both models are available with electric heating device consisting of steel immersion heater with self contained thermostat.

A single lever raises work platform to the top of the machine for inspection, loading and unloading of parts; the same lever also lowers the platform into cleaning tank where parts are immediately and automatically

agitated up and down in the solution. The agitating device of both models is Air Powered—not air agitated—and works off shop's compressed air line.

(Circle No. 20 on Reader Service Card)

Ignition Test Stand

To help mechanics turn out faster and better ignition replacement jobs, C. E. Niehoff & Co. is offering this new Model T-32 fender-high portable test stand.

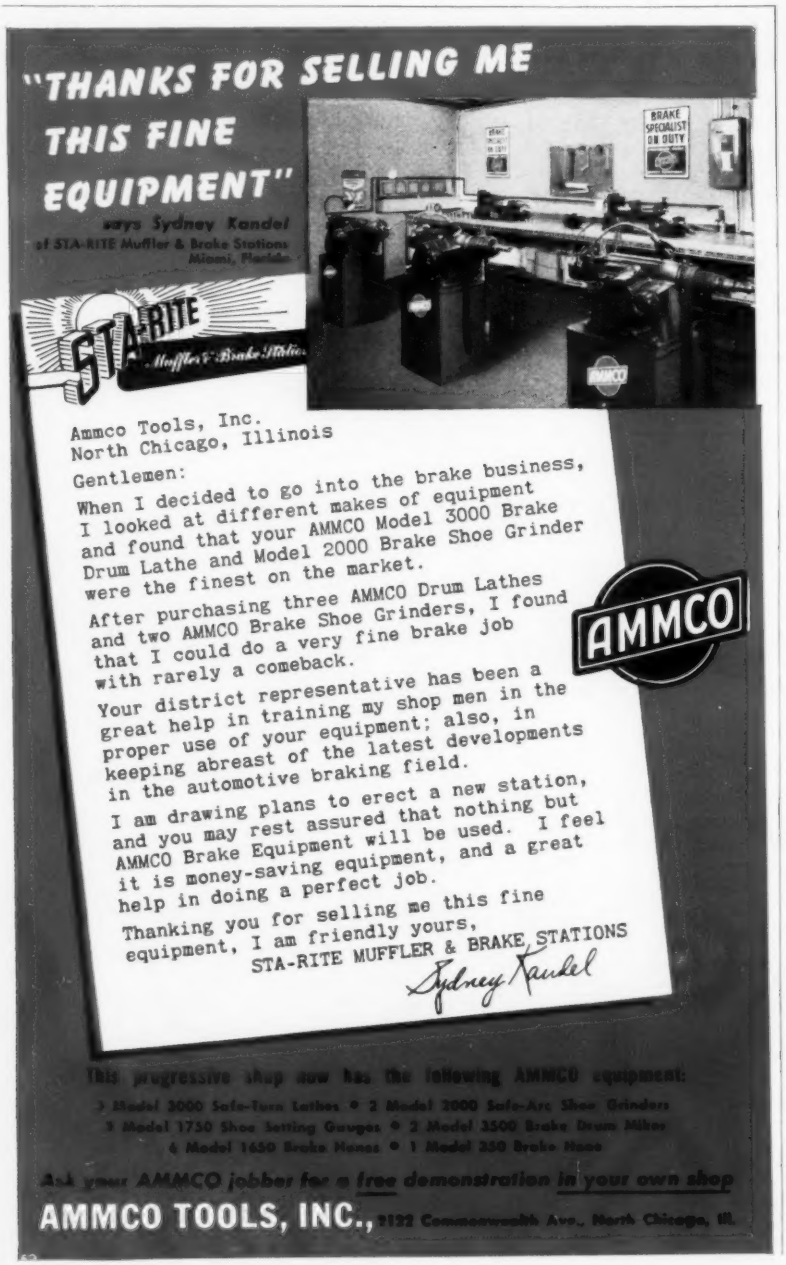
The unit consists of balanced, rolling stand with two instruments: (1) Niehoff T-30 Dwell Meter, for setting contact points and cam angles, and checking distributors; (2) Niehoff TS-31 Tachometer, for setting engine idle mixture, checking carburetor, and checking distributor advance.

(Circle No. 21 on Reader Service Card)

Plastic Dent Repair Compound

Fixadent, a new plastic dent repair compound, recently announced by Taylor & Art, Inc., Plastics, is recommended for use in dent repairs of any size and in small holes and rust-outs. A convenience factor is that only one liquid hardener is needed; it is packed in the Fixadent package. Curing time is said to be from 15 to 20 minutes.

Feol, a special ingredient, is said to practically eliminate the air bubbles heretofore caused by the mixing of plastic dent repair pastes. As a result, the hardened surface is said to contain


"THANKS FOR SELLING ME THIS FINE EQUIPMENT"
says Sydney Kandel
of STA-RITE Muffler & Brake Stations
Miami, Florida
STA-RITE
Muffler & Brake Stations
BRAKE SPECIALIST ON DUTY
Ammco Tools, Inc.
North Chicago, Illinois
Gentlemen:
When I decided to go into the brake business, I looked at different makes of equipment and found that your AMMCO Model 3000 Brake Drum Lathe and Model 2000 Brake Shoe Grinder were the finest on the market.
After purchasing three AMMCO Drum Lathes and two AMMCO Brake Shoe Grinders, I found that I could do a very fine brake job with rarely a comeback.
Your district representative has been a great help in training my shop men in the proper use of your equipment; also, in keeping abreast of the latest developments in the automotive braking field.
I am drawing plans to erect a new station, and you may rest assured that nothing but AMMCO Brake Equipment will be used. I feel it is money-saving equipment, and a great help in doing a perfect job.
Thanking you for selling me this fine equipment, I am friendly yours,
STA-RITE MUFFLER & BRAKE STATIONS
Sydney Kandel
AMMCO
This progressive shop now has the following AMMCO equipment:
3 Model 3000 Safe-Turn Lathes • 2 Model 2000 Safe-Arc Shoe Grinders
1 Model 1750 Shoe Setting Gauges • 2 Model 3500 Brake Drum Mikes
4 Model 1650 Brake Hones • 1 Model 250 Brake Hone
Ask your AMMCO jobber for a free demonstration in your own shop
AMMCO TOOLS, INC., 7122 Commonwealth Ave., North Chicago, Ill.

fewer and smaller pinholes than standard-formula compounds.

(Circle No. 22 on Reader Service Card)

Vacuum Cleaner

A new wet-or-dry automotive vacuum cleaner (Model JB-252-AV) has been announced by the Pullman Vacuum Cleaner Corp., which is an improved version of the company's popular heavy-duty model 152.

Improvements include a new motor head, which has been completely re-

designed, as well as a new instantly adjustable toggle-type hold down clamp that securely locks the motor head onto the cannister.

The new model uses a self-cooling by-pass AC/DC 1¼ hp. motor which is said to give greater suction than ever—due to a larger exhaust area which reduces back pressure while increasing suction efficiency.

The unit is available for 115, 64, 150 or 230 volts, cycles are 0-60 inclusive with tropical winding on special order. There are multistage turbine fans. Height of unit is 31", diameter 16" and water-lift 75" maximum. Container capacity is 17 gallons, recoverable 1¾ bushels or 12 gallons.

(Circle No. 23 on Reader Service Card)

Front End Lift Improved

The Lee "Jr" air-operated front end lift, a product of Automotive Equipment Mfg. Co., has been lengthened 2½" and the lifting height has been increased 2½", allowing more working room for the mechanic. The mechanical safety device which locks the air lift at progressive working heights has been modified for still greater safety in operation.

According to the manufacturer, brake and tire shops have found the Lee "Jr" Front End Lift a versatile piece of shop equipment for rotating tires, wheel balancing and other brake and wheel jobs. It is smaller and more compact than the standard Lee End Lift and stands on end—out of the way, when not in use.

With a pair of rocker-head stands, a mechanic can get all four wheels off the ground, using the lift from the

front end only, in one easy operation. Shops have found the Lee "Jr" ideal for servicing foreign cars as well.

(Circle No. 24 on Reader Service Card)

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

TOW-TRUCK OPERATORS:

Do You Have Up to $4,000 Invested in This?

THEN YOU NEED THIS

At last! . . . an Inexpensive Tool for Properly and Efficiently Towing the Automatic-Transmission Automobile!

The TIMCA STEERING WHEEL

TOW LOK $18.75

Make your major investment PAY OFF . . .

The All-Steel TOW-LOK is the one permanent tool that will save you time and trouble on practically every towing job today. Will not damage, scratch or mar interior of car. The TOW-LOK is safer for traffic, safer for the towed vehicle—and saves up to 15 minutes tying steering wheel on every single haul. With a TOW-LOK on the tow truck, the driver will never again find it necessary or expedient to haul an automatic-transmission vehicle with the rear wheels down!

- Positively locks steering wheel in seconds
- Unprecedented safety towing in traffic
- Completely enclosed in car—windows can be kept closed in wet and inclement weather
- No more bother with ropes and makeshift arrangements
- Ends risk of damage to door handles, horn ring, etc.—eliminates possibility of taut ropes marring dashboard, painted or plated surfaces
- Every day more and more cars require towing from rear
- A money-back guaranteed necessity

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ORDER TODAY direct from factory. Shipped promptly. Postage prepaid if check accompanies order.

TIMCA PRODUCTS CO.
Detroit 1, Michigan
Gentlemen: Please rush me _____ TOW-LOK(s) at $18.75 each.
NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

A Quality Product Guaranteed by TIMCA PRODUCTS CO. Detroit 1, Mich.

The little package with THE BIG ANSWERS!

BPS CHOKE-STOVE

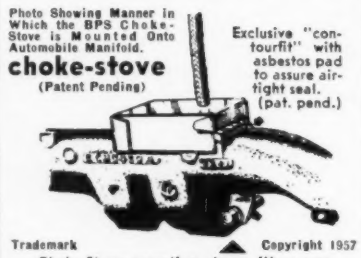
Photo Showing Manner in Which the BPS Choke-Stove is Mounted Onto Automobile Manifold.
choke-stove
(Patent Pending)
Exclusive "contourfit" with asbestos pad to assure air-tight seal. (pat. pend.)
Trademark
Copyright 1957

Choke-Stove mounting strap. (Uses one manifold bolt.) No holes to drill.

This is the inexpensive replacement for the original heat tube on late model cars —which effectively and permanently solves the carburetor problems of hot and COLD weather driving!

BPS CHOKE-STOVE is a great item for all jobbers—providing a sure-fire door opener to any service shop or dealer, while returning real and worthwhile profits!

BPS CHOKE-STOVE is an indispensable stocking product for all repair shop and dealer shelves—providing the sure cure for carburetor headaches, sticking chokes, hard starting and rough performance. Easy to sell, easy to install and profitable!

BPS CHOKE-STOVE is a MUST for the motorist customer — providing safer, smoother, more pleasurable and economical driving! AND FOR ONLY $5.95 LIST!

BPS CHOKE-STOVES are available for Ford, Mercury, Lincoln, Thunderbird, Continental 55-57; Chevrolet 57-58; Oldsmobile 56-58; Chrysler, DeSoto, Dodge, Plymouth, Imperial—55-57.

WRITE FOR FULL INFORMATION ON THIS GREAT PRODUCT!

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Los Angeles 18, California

Announce authorized inspection center plan for independent automotive service shops

● PLANS TO ESTABLISH a network of reliable, recommended service shops, which would provide and merchandise dependable and unbiased inspection service to motorists, have been announced by National Automotive Inspection Bureau, Inc., of Milwaukee, Wis.

According to the organization, the purpose is to assure motorists of results based on approved scientific testing and inspection procedures. Each of the authorized shops will be provided with N.A.I.B.'s Official Manual—which details and illustrates the exact methods to be used—and with standard Report Forms. The work is to be guaranteed to the extent of giving the customer in service labor, the equivalent of the fee he pays.

OFFER RANGE OF SERVICE

Three types of inspection will be sold by the appointed service centers: Condition, Safety and Performance inspections. The first two are to be provided by all shops in the network; Performance Inspection only by those which are equipped with specified test instruments.

N.A.I.B. reports it will appoint only one shop in towns of up to 10,000 population; and not more than one shop per 8,000 inhabitants in larger towns and cities. In return for the fee paid to the organization, the member shop will receive the Official Manual; Report Forms for each type of inspection authorized; an illuminated display sign; certificate of authorization to render N.A.I.B. service; a supply of brochures, "Why you need Official Inspections," to be distributed to prospects; periodic bulletins concerned with technical, sales and advertising problems; and free counsel on such problems by members of the headquarters office staff.

INSPECTION NEED IS WIDE-SPREAD

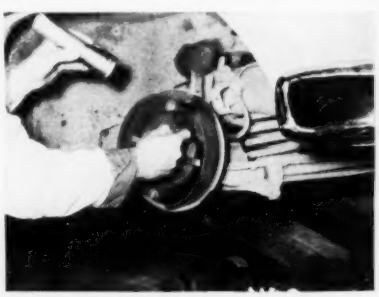
Most shops often encounter the request for an inspection, N.A.I.B. points out. One of the most common situations is a motorist's desire to have a car he is thinking of buying, looked over as to whether it is in good condition — particularly in *safe* condition. Of course, such service to a regular customer is usually rendered free . . . and consists of looking the vehicle over quickly, perhaps driving it around the block. When such a request is made by a stranger, the shop usually "tacks on" a small charge—but again, most often doesn't "go deep" in checking the car.

Naturally, according to the organization, there's also the situation where the owner wants to know what work really needs to be done on his car, but is afraid to ask, for fear of "being sold a bill of goods." All of these problems can be well and easily met, it's claimed, when inspection operations are done on an organized and efficient basis, for a reasonable fee. There would be no feeling of obligation to have the work done, in return for free inspection; nor suspicion of the shop giving a "scare" report in order to get paid business.

OBJECTIVES

Among objectives of the proposed network of associated and accredited service shops are: to give its members prestige in the eyes of customers; to promote standardized, proved inspection procedures; go over used cars, bumper-to-bumper for prospective purchasers, and give a report that can be relied upon; provide a Safety-Check far more complete than that possible in the 11-point annual campaign—which itself proves the need. By special arrangement, interested ASD readers can obtain complete details on this organization . . . by circling No. 99 on the Reader Service Card in this issue.

Two of the N.A.I.B. Condition Inspection procedures: left—checking the condition of brake linings; right—determining the amount of blow-by from a gunned engine.



How to Service a Lube System Contaminated by Glycol Anti-Freeze

Should a customer drive into your shop with the complaint that his glycol base anti-freeze has leaked into the crankcase, here is what you can do to remove the contamination, as recommended by the Chrysler Service Department. These recommendations, however, apply *only* when the engine can still be operated at idling speeds.

Needless to say, the first thing to do is locate and correct the source of coolant leakage before attempting to clean out the glycol contamination; otherwise the condition will repeat itself.

After the leakage source has been corrected, completely drain the crankcase, remove the oil filter element (if used) and fill the crankcase with a mixture of approximately 3 qt. of SAE 10W motor oil and 2 qt. of Butyl Cellosolve (obtainable from chemical supply firms).

Then operate the engine at idling speed (preferably out of doors) for thirty minutes, paying particular attention to oil pressure, and then immediately drain the crankcase. To maintain a 5 p.s.i. minimum oil pressure, a small amount of SAE 30 engine oil may be added to the mixture.

After draining mixture from crankcase, a flushing solution of approximately 3 qt. SAE 10W motor oil and 2 qt. kerosene should be circulated in the engine at idling speed for approximately five minutes and then completely drained.

Install a new filter element and refill the engine with fresh oil of the appropriate grade and classification.

Another acknowledged authority "tells all" about a current service shop problem next month in an exclusive interview with ASD editors and readers.

Calendar of Automotive Events

1958

Oct. 15-18—National Glass Dealers Assn., 1958 Convention, Americana Hotel, Miami Beach, Fla.

Nov. 3-6—Automotive Warehouse Distributors Assn., Inc., National Convention, Muehlebach Hotel, Kansas City, Mo.

1959

Jan. 17-25—Chicago Automobile Show, International Amphitheatre, Chicago, Ill.

Jan. 31-Feb. 4—National Automobile Dealers Assn. Convention and Equipment Exhibition, Conrad-Hilton Hotel, Chicago, Ill.

Feb. 15-17—Motor and Equipment Wholesalers Assn., National Convention, Conrad Hilton Hotel, Chicago, Ill.

Feb. 15-17—Automotive Affiliated Representatives Meetings, Pick-Congress Hotel, Chicago, Ill.

Feb. 18-21—Automotive Service Industries Show, Navy Pier, Chicago, Ill.

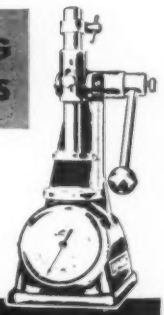
Feb. 27-March 8—World Wide Auto Show, Miami Beach Exhibition Hall, Miami Beach, Fla.

March 11—MEWA Western States (PAS) Conference, Fairmont Hotel, San Francisco, Calif.

March 12-15—Pacific Automotive Show, New Brooks Hall, San Francisco Civic Auditorium, San Francisco, Calif.

May 3-8—Top Management Institute, Motor and Equipment Wholesalers Assn., Allerton House, University of Illinois, Monticello, Ill.

RIMAC SPRING TESTERS



In service and overhaul operations of car, truck, bus and farm machinery, proper tension of springs — valve or clutch — is vital! With a Rimac Spring Tester the mechanic sees both length and tension at a glance. Tests springs up to 2" diam., 4½" length — capacity 0.250 lb.

ASK YOUR JOBBER OR WRITE FOR LITERATURE

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BLITZ BATTERY CHARGERS

Are Money Makers for Any Shop because they are priced right and fully guaranteed.

A COMPLETE LINE OF CHARGERS
6 and 12 Volts—Fast and Slow
BATTERY WHEELER
BATTERY CHARGING JUMPERS
BATTERY CARRIERS
BATTERY POWER UNITS
TRICKLE CHARGERS
STANDS
WARNING SIGNALS
EMERGENCY STARTING CABLES

Write today for new catalog, prices and details

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"$16,000 A YEAR SERVICING RADIATORS!"

"My first year I took in $12,000. My second year $16,000!"
McRILL AUTO SERVICE
TWIN FALLS, IDAHO

MANY MAKE OVER $10,000 A YEAR! "After 3 months we are doing $850 per mo. in radiator work and increasing all the time"—Robbins Motor Co., Marlow, Okla. "Now going at rate of $18,000 a year," says Clough, Storm Lake, Ia. You, too, can do this well!

20,000,000 Radiators Need Servicing Yearly! And with today's engine power increased, cooling capacity decreased, radiators will require more service than ever! Get your share of this huge profit potential—now!

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Please send new free book, "Blue Print For Profits."

FIRM _____
(PLEASE PRINT)
ADDRESS _____
CITY _____ ZONE ____ STATE _____
BY _____ TITLE _____
If dealer, make of car sold _____
Are you now operating a radiator dept.? ☐ Yes ☐ No

Instrument Corner . . .

(Continued from page 6)

one corner of the shop, covered with dust. He went over and got it, wiped it off, and took it to the automobile. Without a word, he connected the meter directly across the battery to be sure it would work. Then with the lights and ignition turned on, he started checking circuits. With the cranking motor operating, he found that there was a voltage drop of .6 volt in the ground connection at the engine and only 3.8 volts at the coil. He pointed to the meter and said, "Now can you see why it wouldn't start?"

"Tighten up the ground strap and the contacts in the ignition circuit. I think that will cure the trouble, but to be sure, we'll make a few more tests." He went to his truck, got a dwell meter, and checked the dwell, which he found to be within the specified limits.

Stepping on the starter caused the engine to start on the first compression, much to the pleased surprise of the shop man. "Now, aren't you ashamed of yourself," Jim said to him. "I ought to charge you ten bucks for this, but I'll call it square when you sign the order for the equipment you need. I'll even show you how to use it to make more money, so actually it won't cost you anything . . . and I'll be around if you get stuck again."

Needless to say, the customer was happy to get his car fixed finally, and the shop man was proud of his new instruments and the additional field of service it opened up for him.

Testing "Tells on" Trouble

When the Instrument Man stopped in Bob's Servicenter, Bob told him of a job he had done that morning. After making a few area tests to locate the reason that the car did not start as it should, and finding that all that was needed was a new battery cable, he told the customer, "That will be $3.50."

"What!" the customer exclaimed. "Was that all that was needed? I sure am glad that I found you. Just listen to what I have been through.

"A week ago I left word at the garage where I keep the car, to have it in front of my office at noon. They got it there on time all right, but there was a note on the steering wheel saying they had trouble starting the engine and had given the battery a fast charge. I got the car started after a little trouble, but when I started home that evening I just barely was able to get the engine going. When I parked the car in the garage I left word for them to put in a new battery.

"When I called for the car the next day they told me that the battery was O.K. as it took a slow charge over night and tested out all right. Apparently the generator was at fault, so they put in an exchange generator which cost me $32.00. Two days later the battery went dead again. This time it was the voltage regulator that was the cause of the trouble and a new one was put on at $7.50.

"That was two days ago and I was just able to get the thing going this morning. So when I passed your shop, I thought I would make one more try to correct the trouble. It was luck for me that I did."

"I don't think you will have any more trouble in starting the engine," said Bob. "If you do, give me a ring. Here is my card."

Two weeks later the telephone rang. When Bob answered, a voice said, "Remember me? I'm the one who got a battery cable from you a short time ago. I just want to tell you that the engine starts fine now, and I sure appreciate knowing where I can take it for service from now on. I'm telling my friends about you too."

This true story illustrates what is happening all too often, all over the country, simply because too many shops fail to use the little gadget called the "voltmeter."

CONTROLLED PRESSURE

BRAKE CYLINDER HONE

Lisle BHX

One Hone for All Cylinders 3/4" to 2" Model BHX

Gives you controlled pressure over 3/4"-2" wide range.

Here are 4 Big Reasons why the LISLE BHX *is your best buy:*

1. Bite can be adjusted without removing hone from cylinder.
2. Only one size and type stone for all work.
3. Hones to the very end in step-cut and blind-end cylinders.
4. Flexible shaft makes it easy to hone cylinders on the car.

EASIER, FASTER, BIGGER RANGE . . .

THE Lisle GBX GLAZE BREAKER

(FULL 2" TO 7" RANGE)

- Adjustable to control pressure in all sizes of cylinders.
- Easy to insert and remove from cylinder.
- Three stones remove glaze in just seconds.
- Operates with electric drills from 1/4" to 3/8".

it's a Good tool...it's a Lisle

ASK YOUR JOBBER

LISLE CORPORATION . CLARINDA, IOWA

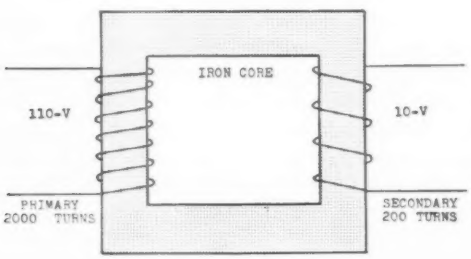
BRUSHING UP ON THOSE EASY-TO-FORGET THINGS

Refresher course

The transformer— what it does, and why

• IN AN "INDUCTION" COIL, such as used in conventional automotive battery ignition systems there is a straight iron core which is surrounded by two concentric coils of wire, a primary and secondary. The primary winding is made up of a few turns, while the secondary has many turns of much finer wire.

When the battery current passing through the primary is suddenly interrupted (distributor contact breaker, for example), a high voltage is induced in the secondary winding. This high-voltage causes a series of sparks to pass through a gap. The gap in this case is that of a spark plug.



A transformer is a voltage changer and uses an iron core, usually rectangular, which furnishes a closed magnetic circuit.

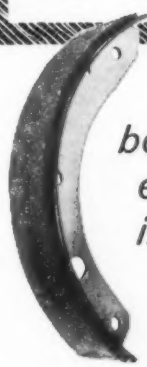
A transformer differs from the conventional ignition induction coil in that the core usually is rectangular and furnishes a closed magnetic circuit of iron. A transformer differs also because alternating current is applied to the primary which sets up an alternating magnetic flux in the core. This, in turn, induces an alternating current in the secondary of the transformer.

Thus, a transformer is essentially a voltage changer. It does not change alternating current to direct current. A transformer, for example, is used to lower the conventional 110-volt lighting circuit to 5 or 10 volts for operating an electric door bell.

"Hey, you better STOP that—with National, of course!"

for quicker and safer stops – brake shoes bonded with

FRICTION CONTROLLED
NATIONAL
Brake Block



skillfully bonded by an experienced independent bonder in your area!

Friction controlled for longer service, NATIONAL'S dense, brass chip-impregnated composition assures quick acting safe braking – even under conditions of extreme heat. In any weather you can rely on NATIONAL for soft, sure stops.

Write now for details

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BRAKE BLOCK COMPANY
Since 1919
37-17 57th Street, Woodside 77, N. Y.

NEXT TIME INSIST ON

This stuff really cleans fast!
GRAYMILLS
606
FORMULA
That 606 really rinses clean -- NO MORE stinky odor that won't wash off
And it keeps on cleaning up to 6 times longer than ordinary cleaners
CARBURETOR CLEANER
Hey! This "606" doesn't burn my hands!
68

GET IT FROM YOUR JOBBER

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Home Training Program in

AUTO MECHANICS

A comprehensive program which serves excellent for review or reference. Ideal for the man who has picked up a little here and there and wants to systematize his knowledge. Employers interested in sponsoring the program for selected employees can take advantage of tuition discount plan. Write for free information.

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ADDED PROFITS
FROM
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AN EXCEPTIONAL OPPORTUNITY FOR GREATLY INCREASED PROFITS IS OPEN TO A LIMITED NUMBER OF SERVICE SHOPS WHICH CAN QUALIFY AS

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This is a ready made opportunity to start a new department, with no increase in space, equipment, or personnel required. Everything needed is furnished, with complete instructions for performing Professional Inspections. You keep the fees. Open to Independent Service Shops, Garages, and Service Stations doing light mechanical work.

Cut out and mail coupon for further information

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Please send details of the National Inspection Program without obligation:

Business Name .....

By .....

Address .....

City & State .....

Type of Shop .....

Salesmanship . . . *(Continued from page 25)*

different parts and services. Not every customer will fall into a nice little niche, but they'll usually fall into general groups which will permit you to sell with direction rather than hit or miss.

The more you learn about him, the more you can sell him—and sell him things he really needs. Very often a sales suggestion that fits the customer's habit pattern will not be interpreted as a sales effort; the customer will feel it is an act of consideration and friendliness. If time permits, keep a confidential file on each customer. Find out when he's going on vacation so you can suggest a pre-vacation tune-up at the most opportune time. Find out where he plans to spend his vacation. Maybe he'll need snow tires, chains or window screens.

Does he have a garage? If not, maybe he needs a tarp to cover his car (he **might** be just the kind). How about a heated dipstick to aid in cold weather starting if his car sits outside all night? All these things are naturals, and they all stem from knowing the customer. Almost every unusual characteristic about a customer leads directly to more sales.

DON'T MISS A TRICK

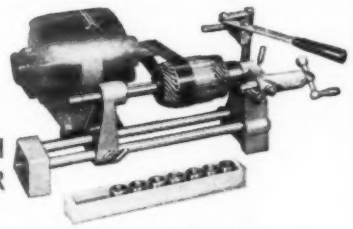
If he complains of back trouble, for instance, the special cushions you happen to have in stock were designed with him in mind. If he has an unusual job, like a diamond salesman, suggest burglar alarms or tear gas pistols. Don't miss a trick. Turn everything into a selling situation. Be alert to the selling opportunities that come literally knocking on your door. Put on an invisible pair of eyeglasses that will enable you to spot a potential sale the minute it shows its dollar sign nose. Don't be a high pressure pusher, be an alert, conscientious, thoughful, friendly man who just happens to have what the customer needs when he needs it.

Use your bag of tricks with discretion. Don't try the same thing on the same customer time after time. Don't try a pitch on one customer, get rejected, then turn around and try the same pitch on a man standing alongside the first man. This is deadly. It shows both customers that you are just pushing product without interest in satisfying any particular need.

Salesmanship involves systematic procedures. You won't want to use all of them in any one selling situation any more than the plumber uses all his tools on every job. Use only the selling tools that you need to do the selling job.

Very few skills give greater personal rewards, when mastered, than selling. It's a craft that can be applied in practically any job imaginable. A good salesman will always be in demand, and always make an outstanding living. Mechanical know-how, a well equipped shop favorably located, and a sales minded operator can hardly help adding up to a successful business.

TRU-MERIT ARMATURE LATHE —WITH UNDERCUTTER



. . . the Right Tool for Reconditioning Generator and Starter Commutators . . .

Keep profits in your shop with a low-cost, precision built Tru-Merit Armature Lathe. Complete lathe, including pulley, motor mounting brackets, 10 collets, cutting tool and mica undercutting attachment only $57.50 ($79.00 with motor).

Contact your local jobber for complete information or write to:

TRU-MERIT TOOLS, Inc., Box 35, Waukesha, Wis.

The BOWMONK DYNOMETER

- 2¾-INCH DIAL
- GIMBALLED BOWL
- SUCTION-ANCHOR
- SCREW FIXTURES

EASILY *FIXED*—NO CONNECTIONS.

First recording accelerometer developed exclusively for automobiles, now available at low cost. Measures acceleration to check performance before and after tune-up, measures brake efficiency and rolling resistance. Used by leading U.S. auto-testers, British auto and brake manufacturers for road-testing.

Saves hours of tune-up time—increases profits. Demonstrate performance to customers—sell to owner-enthusiasts.
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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

When a newly married couple had their first spat, the young husband decided that this was the time to establish who was boss. "You sit down over there," he ordered. "I want to show you something."

The words, coming from her ordinarily amiable husband, so startled the wife that she meekly sat down. He reached into a closet, took out a pair of pants.

"See these pants?" he demanded. "Well, I *wear* them around this house!"

At that his wife broke out into peals of laughter. "But," she managed to gasp, "those are *my* dungarees!"

★ ★ ★

An old Wisconsin farmer was showing one of his city relations some of the country sights.

"My goodness," exclaimed the urbanite, "look at all those fields, all those cattle, the splendid farm buildings, and the up-to-date farm homes. This community must certainly abound with prosperity."

"'Tweren't prosperity that built all those fine homes," the farmer said, "'Twas jealousy."

★ ★ ★

A young fellow in the naval reserve was telling his friends that if he was ever called for active duty he would like to be assigned as commander of an LMD.

"What is an LMD?" asked a friend.

The young fellow quickly replied: "Why, it's a Long Mahogany Desk!"

★ ★ ★

A mechanic about to have a tooth pulled was so terrified at the prospect that the sympathetic dentist offered him a shot of whiskey to calm his nerves. That seemed to help so he gulped down still another.

"Feel any braver?" asked the dentist.

"Do I feel any braver?" snarled the mechanic. "Brother, I'd like to see anybody try to mess with my teeth now!"

★ ★ ★

Did you hear about the boy who asked the druggist for a package of frozen band aids—for use on cold cuts?

A small child was explaining to her younger brother that it was wrong to work on Sunday.

"But what about policemen," said the boy. "They have to work on Sunday. Don't they go to heaven?"

"Of course not," replied his sister. "They're not needed there."

★ ★ ★

"Guess what, mummy," said the little 6-year-old, proudly. "I'm the smartest one in my class."

"Well, that makes me very proud," said the mother. "How did the teacher happen to mention it?"

"Oh, she didn't mention it," was the answer. "I just noticed it—all by myself."

★ ★ ★

Most of the shadows of this life are caused by standing in our own sunshine.—Ralph Waldo Emerson.

"And get rid of that engine knock . . . I've answered the door ten times today!"

Neighbors were complaining to Mrs. Jones about the racket her husband was making. "All the time he goes around cackling like a chicken," they griped.

"I know," said Mrs. Jones. "We get tired of it around the house, too. Sometimes we think he's not in his right mind."

"But can't you do something for him? Can't he be cured?"

"Oh, I suppose a doctor could do something, but we need the eggs."

★ ★ ★

The pupils had all been photographed and the teacher was trying to persuade them each to buy a copy of the group picture.

"Just think how nice it will be to look at it when you are grown up and say, 'There's Rose; she's married,' or 'That's Billy; he's a sailor.'"

A small voice at the back of the room piped up, "And there's teacher; she's dead."

★ ★ ★

Two men were discussing the romance of a young neighborhood couple. "What do you think of their getting married?" one asked.

"It's all right, I guess," the other said, "but it's too bad they aren't good enough for each other."

"What makes you say that?"

"Well," was the reply, "I've been talking to both families."

★ ★ ★

No man knows what hard luck is until he buys a new suit with two pairs of pants . . . and then burns a hole in the coat.

★ ★ ★

A Wisconsin farmer, visiting the big city for the first time, stopped in a fancy lounge and ordered a beer.

"How much beer do you sell a week?" he inquired.

"About 40 kegs," replied the bartender.

"I'll tell you how you can sell 80."

"Eighty kegs?" said the bartender. "How?"

"Simple. Fill up the glasses."

★ ★ ★

The man didn't say a word when they ran over his cat with a steamroller. He just stood there with a long puss.

★ ★ ★

A friend of ours recently bought a foreign-made automobile and came to the conclusion that he was not getting the phenomenally high gas mileage so often credited to such cars. So he took it to a local mechanic who, after checking it thoroughly, pronounced it in perfect condition. "But isn't there something I can do to increase its gas mileage?" asked the motorist.

"You can do the same thing all foreign-car owners do," replied the mechanic. "Lie about it."

★ ★ ★

Overheard in a small-town barbershop: "The way the cost of living is rising, a dollar saved is fifty cents lost."

CHROME C-9 OIL RINGS WITH
CIRCUMFERENTIAL EXPANSION ACTION
... for newer engines
Newest advancement in ring design assures a new high in conformability. With an average of 60 outward thrusts, C-9 adapts easily to cylinder variations and variable operating conditions.
RAMCO
RE-POWER
PISTON RINGS
CHROME SPIRO-SEAL
OIL RINGS WITH
CIRCUMFERENTIAL EXPANSION
ACTION ... for older engines
A new high in conformability. Works like a watch spring; gentle outward pressure lets Spiro-Seal adjust to any taper or wear. Provides equalized radial pressure against cylinder wall for positive oil seal.

SMART MOTORISTS WANT RAMCO RE-POWERING

for longer engine life . . .

Of course, they don't *know* they want RAMCO rings—they just want that ring job to *last!*

And so do you, if you want satisfied customers. That's why smart engine men call for RAMCO 10-Up Sets—the kind that last and last and last and last—and bring in "recommend" customers.

Smart engine men know each 10-Up Set contains either Chrome C-9 or Chrome Spiro-Seal oil rings—each with *circumferential expansion action*—each "power-engineered" with chrome to make *any* age engine feel young and gay. That's why you're DOUBLE SURE you'll re-power right—RAMCO right—when your work sheet calls for RAMCO 10-Up Sets.

Be DOUBLE SURE! Call your RAMCO Jobber today.

DOUBLE SURE RAMCO 10 up SETS

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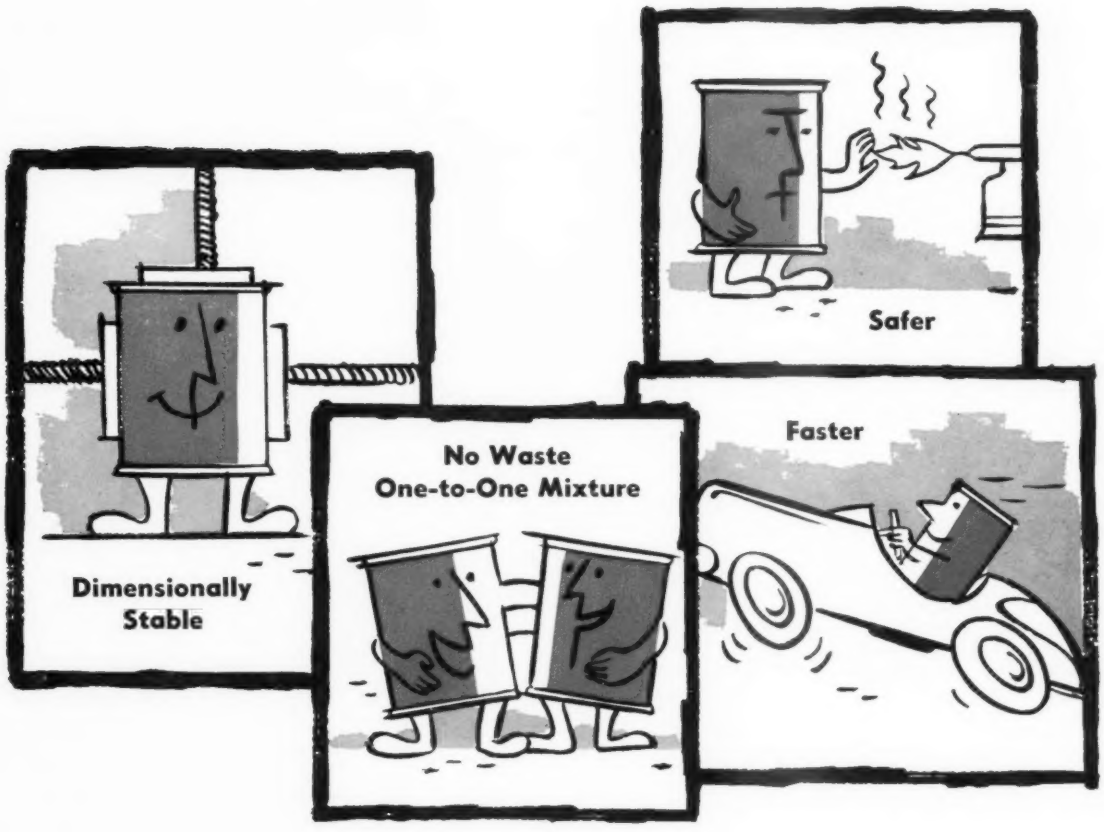

REN PLASTIC SOLDERS

TOOL MAKERS EPOXY PLASTIC NOW FORMULATED FOR AUTO BODY REPAIR SHOPS

Ever wondered what competition is doing . . . wondered if they're keeping up with the latest developments and profitably absorbing them in their operations? Chances are competition has had its eyes open for dollar saving ideas. Ideas like using Ren Plastic Solders . . . the epoxy plastics . . . to save time, material and labor. They've discovered Ren Plastic Solders cost less, go farther and repair as well as lead solder. They know, too, Ren has a minimum of curing after set-up time and won't crack, check or bleed. That lack of shrinkage means a bond that really stays and takes costly "pop-off" out of their lives forever. Know its easy to work (three simple steps to the painting stage), has no odor, creates a minimum of dust and is absolutely safe. We could go on and on telling you why competition buys Ren Plastic Solders . . . but why not see for yourself. You'll be amazed at the savings Ren offers you.

Because auto body repair shops have two types of work problems . . . "rush" and "slow" jobs, Ren developed two solders to help control work load variation. Ren Superfast is the first and only fast epoxy body repair material on the market . . . it sets up in 4 minutes while the Deluxe sets up in 2 hours. Both work along with you.

SUPERFAST – DELUXE

REPAIRS

- Dents
- Holes
- Tears
- Leaks

in gas lines, oil lines, radiator water pipes, motor blocks, heads, gas tanks, vent pipes, transmission housings.

FILL AND REPAIR

- Rocker Panels
- Doors
- Fenders
- Roofs
- Trunks
- Hoods

FOR FRENCHING, HOODING, DE-CHROMING, CUSTOMIZING

ren PLASTICS, INC. LANSING 9, MICH. • SPECIALISTS IN EPOXY COMPOUNDING